Liquidity in Stock Markets

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To My Family

ABSTRACT

This thesis uses liquidity to examine some stock market phenomena. It begins by researching the role of liquidity in explaining the “disappearing dividend puzzle” across several financial markets. Then, it examines the cash/stock dividend payouts and their determinants in China. Finally, this paper investigates the interplay among illiquidity, variance risk premium and stock market returns.

The research studies the disappearing dividend puzzle with a large sample of firms representing eighteen countries over the sample period from 1989 to 2011. Our investigation finds that risk is an important determinant of firms’ dividend payout policy. For firms in the US, France, UK and other European markets, liquidity plays an additional role in explaining the changes in propensity to pay. Then we test the explanatory power of liquidity, risk and catering incentives in the “disappearing dividend puzzle”. The thesis finds support for catering theory among firms in common law countries but not those in civil law countries. The catering incentives persist even after adjusting the propensity to pay for liquidity. However, after controlling for risk, the significant explanatory power of catering incentives in the changes in propensity to pay disappears. Our results indicate that catering incentives capture the risk difference between dividend payers and non-dividend payers.

Then, the research studies the payout patterns of both cash and stock dividend in China over the sample period 1999-2013. The Chinese stock market is a fast-growing market with some special characteristics, such as complicated corporate ownership structures. The specific characteristics of Chinese firms might affect the dividend payout policy in China. We first study the determinants of Chinese firms’ dividend payout policy. Our results indicate that lifecycle, risk and liquidity are important determinants of firms’ cash/stock dividend policy. We find that firms with larger board

size and fewer annual board meetings are more likely to pay cash dividends and less likely to pay stock dividends. Also, the research notes that managerial stake is insignificant in explaining Chinese firms' cash/stock dividend payouts. Then, we investigate the catering theory in China. Our findings show that catering incentives matter in explaining the unexpected percentage of dividend payers if we do not control for liquidity/risk. However, once we control for liquidity/risk, the catering incentives contribute little toward explaining the changes in propensity to pay cash/stock dividends. Our results imply that Chinese firms' cash/stock dividend policy is influenced by the board, rather than managers or investors.

Finally, this thesis investigates the interplay among illiquidity, variance risk premium and market returns. Previous studies that test whether liquidity is useful in forecasting market returns ignore the question of whether variance risk premium might also be useful for this purpose. As a result, these papers potentially overestimate the role of liquidity in predicting market returns. This thesis tests whether liquidity and variance risk premium are useful for return forecasting by comprehensively investigating the interplay among illiquidity, variance risk premium and market returns. We adopt monthly US data from January 1992 to December 2010. The results show that variance risk premium, reflecting investors' risk aversion to volatility risk, causes variations in stock returns, and in turn causes market illiquidity, rather than vice versa. Furthermore, we find that variance risk premium has substantial forecasting power over future market returns, while liquidity measure does not. Additionally, our results indicate that variance risk premium impacts equity returns by acting on the risk factors, i.e. market risk premium, value factor and momentum factor.

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DECLARATION

The content of this doctoral dissertation is based on the research work completed at Durham University Business School, UK. No material contained in the thesis has previously been submitted for a degree in this or any other university.

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Chapter 1 Introduction

1.1 Motivations of the Research

Liquidity is a broad and elusive concept that generally denotes the ability to trade large quantities quickly at low cost with little price impact. In the past ten years, researchers have studied the importance of liquidity in explaining various financial phenomena in the stock market. This dissertation studies the application of liquidity in stock market from three aspects. The first is the use of liquidity to explain the disappearing dividend puzzle across several financial markets. Then this thesis examines the cash/stock dividend payments and their determinants in China. Finally, this paper studies the interplay among illiquidity, variance risk premium and market returns.

1.1.1 Motivations of Liquidity and Disappearing Dividend Puzzle

Fama and French (2001) observe that the percentage of dividend payers declined significantly between 1978 and 1999, from 66.5% to 20.8%. They suggest that the proliferation of newly listed small firms with low profitability and great investment opportunity during that period could explain the decreasing dividends. However, even after controlling for firm characteristics such as size, profitability and investment opportunity, the percentage of dividend payers between 1978 and 1999 still presents a dramatic pattern of decline. Fama and French (2001) term this phenomenon the "disappearing dividend puzzle".

Subsequently, the "disappearing dividend puzzle" has been studied widely. Investigating firm-level data of UK companies, Benito and Young (2003) find that during the period 1974-1995, the proportion of firms that did not pay dividends increased from 14.3% to 25.2%. Examining dividend payments between 1989 and

2002 in Canada, France, Germany, Japan, the United Kingdom, and the United States, Denis and Osobov (2008) note that, although the magnitude of the decline in the propensity to pay dividends differs among the six countries, the fraction of dividend payers in all countries fell during this period.

Attempts to explain the disappearing dividend puzzle draw on a number of theories, including the life-cycle explanation (DeAngelo et al., 2006) and the tax explanation (Julio and Ikenberry, 2004). Liquidity and risk factors have also been advanced as possible explanations of the puzzle. Theoretically, there is a negative relation between stock liquidity and the likelihood of firms paying dividends. As rational investors prefer firms with high liquidity, they impose high discount rates when evaluating firms with low liquidity, thereby lowering their valuations on such firms. In order to raise their valuations, firms with low liquidity are more likely to pay dividends. Banerjee et al. (2007) adopt turnover ratio, illiquidity ratio, trading volume, and proportion of days with no trading as liquidity measures and find that liquidity holds pronounced explanatory power in dividend payout policy after controlling for firm characteristics. This corroborates the evidence found by Bulan et al. (2007) that the incidence of dividend initiations is relatively higher for firms with higher illiquidity. However, they show that change in illiquidity is not a significant predictor of firms' dividend initiations.

Baker and Wurgler (2004b) put forward the catering theory to explain the puzzle. Based on the theory of investment sentiment, Baker and Wurgler (2004b) suggest that managers execute the dividend policy that caters to irrational investors'[1] demand to boost their stock price above the fundamentals (Baker and Kolb, 2009). They construct the dividend premium to measure the prevailing investor demand for dividend payers. The dividend premium is defined as the difference between the book-value-weighted market-to-book ratios of dividend payers and nonpayers. When the dividend premium is positive, there exists a general stock market incentive to pay dividends, and when it is negative there is an incentive not to pay. Also, they note that this measure of investor

[1] As defined in Baker and Wurgler (2004a), irrational investors are investors that view nonpayers as growth firms, and judge the prospects of these firms relative to their own assessment of growth opportunities.

demand for dividend payers would reflect both rational clientele demands and investor sentiment for payers.

The empirical evidence for catering theory is rather inconclusive. The theory finds support in some studies, such as Baker and Wurgler (2002) and Kale et al. (2012). Baker and Wurgler (2002) examine several alternative reasons, such as asymmetry, dividend clienteles, and catering incentive, and claim that dividend premium, the proxy for catering incentive, holds the best explanatory power for the time-series fluctuations in the propensity to pay dividends. Kale et al. (2012) analyse several dividend theories, such as signalling, agency cost and catering theory, using the Compustat data of 5875 US firms over the period 1979-1998, and conclude that dividend premium, the proxy for catering incentive, is positively related to dividend initiations. Evidence supportive of the catering theory is also reported in Baker and Wurgler (2004b), Hsieh and Wang (2006), Neves et al. (2006) and Ali and Urcan (2012).

However, Julio and Ikenberry (2004) and Savovy and Weber (2006) find no evidence for the presence of catering incentive. Julio and Ikenberry (2004) identify a considerable decline in the incidence of dividend payers with US firm-level observations during the period 1984-1999, and claim that catering incentive has little power to explain the declining percentage of dividend payers after controlling for age and size. Similar evidence is reported with international data. Savovy and Weber (2006) select German firm data over the period 1982-2003 and do not find any evidence that supports catering theory, even after controls for current growth rate to avoid multicollinearity. Hoberg and Prabhala (2009) find that after controlling for risk, the explanatory power of the catering incentive disappears. Thus, they suggest that dividend premium matters in Baker and Wurgler (2004a) not because it reflects investors' preference, but rather because it acts as a proxy for risk.

While the inconsistencies in prior empirical research are likely to be at least partially related to the use of different models and estimation methods, some studies also point towards the possibility that country-specific idiosyncrasies impact on the factors that drive dividend payout policies. With a large dataset of firm-level observations from 23 countries over the period 1995-2003, Ferris et al. (2009) suggest that firms cater to investors' sentiment in common law countries but not in civil law countries. The authors point out the difference in results garnered from areas with different levels of investor protection. Compared with those in civil law countries, shareholders in common law countries hold more protection. For example, the investor protection laws in common law countries encourage more accurate financial reporting (Leuz et al, 2003). Thus, managers and controlling shareholders in these countries are less likely to expropriate the firm's resources and more likely to invest in projects that benefit shareholders (Wurgler, 2000; Shleifer and Wolfenzon, 2002, Bakaert et al. 2010). Hence, shareholders in common law countries have more right to force managers to cater to their demand. However, this finding is inconsistent with that of Denis and Osobov (2008), who document that the estimated coefficients of catering incentive are insignificant in common law countries and significantly negative in civil law countries. By contrast, the estimates reported in Denis and Osobov (2008) are in line with the agency-cost explanation of dividends payment. Alternatively, Renneboog and Szilagyi (2006) document the application of catering theory in Dutch listed companies due to their special structure and mechanisms.

1.1.2 Motivations of Corporate Governance and Dividend Policy

Unlike those markets that have been used previously to explore the disappearing dividend puzzle, China has a unique economic and financial environment. Investment in listed companies is a comparatively new phenomenon in China. Since the inception of the Shanghai (SHSE) and the Shenzhen (SZSE) Stock Exchanges, the Chinese stock market has experienced a rapid expansion; nevertheless, in terms of regulation the Chinese capital market lags far behind that of countries such as the USA or UK. These specific characteristics of Chinese listed companies and the Chinese stock markets might lead to different financial behaviours and dividend policies than those observed in other countries, which make the setting worthy of exploration.

One of the important characteristics of Chinese firms is the existence of large numbers of state-owned firms, thus it is worthwhile to consider the potential impact of the existence of controlling government block ownership on firms' propensity to pay cash/stock dividends. If government blockholders effectively contribute to the supervision and control of managers, the presence of controlling government blockholders is likely to improve corporate governance (Chen et al., 2009) and increase the pressure on managers to pay dividends. However, alternatively, there is a risk that, due to a lack of personal economic incentives, government representatives contribute little to corporate governance (Chen et al., 2009), or they might indeed collude with managers to exploit other shareholders in order to pursue government objectives, such as economic growth and employment (Firth et al., 2010). In this case firms might be less likely to pay dividends.

Stock dividends payment is another a significant feature of Chinese firms' dividend policy (Chen and Yuan, 2004). Wei and Xiao (2009) suggest that on average 34.46 per cent of listed Chinese firms pay stock dividends over the period 1993-2006. They argue that the listed companies in China would like to pay stock dividends Research also finds that public investors in China favour stock dividends over cash dividends. (Chen and Yuan, 2004) Chen and Yuan (2004) argue that the rapid expansion of Chinese stock market in terms of market capitalization and number of listed companies implies strong public demand for stock shares. This is mainly because that there have been limited investment opportunities in China for individuals. Until 1998, the real estate market and mutual funds do not exist in China. Also, before the inception of the Shanghai (SHSE) and the Shenzhen (SZSE) Stock Exchange in 1990, limited government bond and bank deposits are individuals' only investment opportunities in China. (Wei and Xiao, 2009) In addition, in China, the return on equity is generally high. Zhang (1998) reports that the average premium on initial public offerings is about 90 per cent. Furthermore, as the capital gains from stock investments are tax free, both individuals and institutional investors would like to invest in the stock market. We therefore set the second chapter in a Chinese context to study both the cash dividend and stock dividend payment patterns in China.

Meanwhile, although there is a general acknowledgement that dividend payments, managerial ownership and board structures all contribute to control agency-problems in firms (Brockman and Unlu, 2009; Chen and Yu, 2012; La Porta et al., 2000b; Setia-Atmaja et al., 2011), prior empirical literature tends to ignore the potential impact of firm-specific corporate governance on managers' catering to investors' preferences for dividend payments. If capital markets are efficient and investors perceive managerial ownership or board structures as substitutive corporate governance mechanisms to dividend payments, managers in firms with high levels of managerial ownership and comparatively strong and independent boards are expected to be under less pressure to pay dividends. This suggests a positive relationship between these variables and the propensity to pay dividends. However, alternatively, if capital markets are inefficient, dividend payments are more likely to be under managerial discretion. In this case managers' ownership incentives and independence of the board of directors are likely to determine managers' ability and incentive to engage in opportunistic behaviour. This suggests a negative relationship between managerial ownership, key board characteristics and the propensity to pay dividends.

1.1.3 Motivations of Liquidity, Variance Risk Premium and Market Returns

A growing literature shows that volatility risk and (il)liquidity risk can predict future excess stock returns. However, it is still unclear whether stock returns are triggered by these risk factors. Variance risk premium is defined as the difference between implied volatility and realized volatility. It contains information on both conventional risk measures, and also reflects exclusive information of investors' risk aversion to the volatility risk (Bakshi and Madan, 2006). Bollerslev, Tauchen and Zhou (2009) and Drechsler and Yaron (2011) examine the predictability of variance risk premium for the US stock market return, and find that the variance risk premium has a strong predictive power at monthly and quarterly horizons. However, Zhou (2010) adopts a different measure of variance risk premium, and finds that the variance risk premium cannot predict market returns.

With regard to (il)liquidity, a number of studies suggest that (il)liquidity plays a substantial role in forecasting future stock market returns (e.g., Jones, 2002; Baker and Stein, 2004). These studies indicate that increases in liquidity predict lower future returns. Considering the existence of irrational overconfident investors and the short-sale constraints, Baker and Stein (2004) advance a behavioural explanation for the liquidity-return relation over time. Specifically, irrational investors overreact to the private information about future fundamentals and thus boost the liquidity. The short-sale constraint eliminates the possibility that the irrational investors' valuation is lower than that of rational investors. Hence, higher liquidity serves as an indicator of greater presence of these irrational investors, and, as a result, of the extent to which the market is overvalued. Jones (2002) studies the annual time series of liquidity and stock market returns over the entire 20th Century for the US market. The results imply that liquidity can predict future market returns up to 3 years ahead. Similar evidence is reported by Lesmond, Ogden and Trzcinka (1999) and Bekaert, Harvey and Lundblad (2007).

However, if we step out of the traditional view on the liquidity-return relation, and question how the liquidity might be generated, it is quite natural to expect that return could affect future liquidity. This is empirically confirmed by Chordia et al. (2002) and Griffin et al. (2004). Chordia et al. (2002) document that stock market returns are able to forecast future market (il)liquidity rather than vice versa for the US market. Similarly, with a large sample of data across 46 countries, Griffin et al. (2004) find a positive relationship between past stock returns and future trading activity, which is measured by turnover. Their results show that an up market predicts higher (il)liquidity, with approximately the same magnitude of effect as for a previous down market. However, there is no generally agreed explanation for the relation between past stock returns and future liquidity. Chordia, Roll and Subrahmanyam (2002) adopt an inventory paradigm to explain the relationship between past returns and future liquidity. According to the theory, (il)liquidity depends on the inventory holding cost, which arises from financing constraints and risk. Such cost seems particularly high in falling markets, where market marker inventory levels might be quite high, and vice versa.

Thus, (il)liquidity will follow the previous market moves. In addition, behavioural theories, such as overconfidence bias theory (Odean, 1998) have been explored to explain the association between past returns and (il)liquidity, while Griffin et al. (2004) have investigated participation cost theory in this regard. However, Bekaert et al. (2007) find that liquidity can be predicted by past market returns only in emerging markets, and not in the US. They also note that the participation cost cannot be used to explain their findings.

Hence, the literature for the return-liquidity relation has not come to a generally agreed conclusion. Furthermore, to date there has been no comprehensive examination on that relation. Therefore, it is important to comprehensively study the direction and magnitude of the return-liquidity relation.

Moreover, the association between the variance risk premium and the market liquidity has not yet been investigated in the literature. If return can impact the future market liquidity, then the variance risk premium may also affect the future liquidity. Failure to recognize that liquidity is the causal variable may cause misjudgements in the interplay among liquidity, stock return, and variance risk premium. Also, if liquidity responds to past returns or past variance risk premium then it makes sense to include these variables to supplement any forecasting tests of liquidity. Doing so is likely to avoid overestimating the true forecasting power of liquidity. Previous studies mainly focus on the determinant role of the variance risk premium and liquidity; hence it is important to comprehensively test the interplay among variance risk premium, illiquidity, and stock returns.

1.1.4 Objectives

The research questions of the thesis are as follows:

- An investigation into the determinants of dividend policies across a large sample of firms representing 18 countries, over the period 1989-2011.

- Could liquidity/or risk explain the declining propensity to pay dividends across several financial market?
- A re-examination of the validity of the catering hypothesis after adjusting the propensity to pay with the key determinants, e.g. risk, liquidity, and life-cycle effect.
- An examination of the cash and stock dividend payment patterns in China.
- An investigation into the impact of shareholders, managers and board on the dividend payout decisions among Chinese firms.
- Could governance blockholders determine the cash/stock dividend payments in China?
- Are liquidity/risk/lifecycle/leverage the determinants of cash/stock dividend payment policies in China?
- An investigation of the validity of the catering hypothesis after adjusting the propensity to pay with corporate governance variables and other key determinants, e.g. risk, liquidity, and lifecycle in China.
- A study of whether past liquidity could cause stock market return, or whether past stock market return could affect market liquidity.
- An investigation into the direction and magnitude of the relationship between variance risk premium and return using the Granger-causality test and impulse function.
- A test of forecasting power of the variance risk premium and liquidity for excess stock market returns.
- A study of how the variance risk premium/liquidity are related to the US equities returns by investigating into the relation between variance risk premium/liquidity and the risk factors, specifically, Carhart (1997) four factors.

1.2 Main Findings and Contributions of the Research

This thesis contributes current literature from the following aspects.

1.2.1 Liquidity and Disappearing Dividend Puzzle

The first contribution of this research is to use stock market liquidity to explain the declining propensity among firms to pay dividends. Banerjee et al. (2007) study the link between liquidity and dividend policy but do not test for the role of liquidity in explaining changes in the propensity to pay dividends. Furthermore, we explore the life-cycle, risk and catering explanations on the changes in propensity to pay. We find that catering incentives have a significantly positive impact on the changes in the unpredicted proportion of dividend payers for firms operating in common law countries in our sample, namely Canada, Hong Kong, Singapore, Australia and the UK. The result is insignificant for the case of firms operating in the US and in civil law countries, namely France, Germany and Other European countries. Our results concur with Ferris et al. (2009) in that countries with greater investor protection (common law countries) are more responsive to changing investor preferences and therefore significant catering occurs in such countries. The existence of catering incentives is still significant when the changes in propensity to pay are adjusted for liquidity or life-cycle effect. However, when adjusting the propensity to pay for risk, we find little evidence for the existence of catering incentives, even among the common law countries. Our results indicate that the role of catering reflects the risk-reward relationship in the changing propensity to pay dividends. In other words, catering incentives actually capture the risk difference between firms that pay dividends and firms that do not. Our evidence corroborates Hoberg and Prabhala's (2009) findings in the US market and reveals that the risk-based explanation of the catering phenomenon persists across several financial markets.

The second contribution of this research is that we employ several liquidity measures, namely turnover ratio, Amihud's (2002) illiquidity ratio, relative bid-ask spread and Liu's (2006) liquidity measure, thereby capturing the different dimensions of liquidity. We find that the traditional liquidity measures - illiquidity ratio and relative bid-ask spread - do not explain the dividend payout policy in most markets. However, turnover ratio and Liu's liquidity measure significantly explain the probability of a firm being a dividend payer, with turnover ratio highly significant for all nine financial markets. This means that the trading quantity dimension of liquidity significantly explains the propensity to pay dividends. When considering the liquidity effect along with risk, we find the effect of liquidity is significant in the case of the US and UK, France, and Other European markets. Hence for these markets, liquidity is an additional important determinant of dividend policy, along with risk.

1.2.2 Corporate Governance and Dividend Policy

While previous research has considered the impact of board characteristics (Anderson et al., 2011) or managerial ownership (Nam et al., 2010) or investors' preference (Baker and Wurgler, 2004a) on firms' dividend payout policy, this research considers all three aspects. Hence, the first contribution of Chapter 2 is to consider the impact of shareholders, managers and board on the payout decisions. We find that for both stock dividend and cash dividend, managerial stake contributes little toward explaining firms' dividend decision. Our results also show that firms with larger board size and fewer annual board meetings are more likely to pay cash dividend to mitigate the conflict between firms and investors. In addition, such firms are less likely to pay stock dividend. Further, this chapter finds that after controlling for risk/liquidity, catering incentives are insignificantly related with propensity to pay cash/stock dividend. Therefore, board rather than investors or managers impacts cash/stock dividend payout policies in China.

This chapter further makes the second contribution, which is to study the time series cash dividend payout pattern in China, to explore changes in the cash dividend payment pattern. We observe significant decline in the percentage of dividend payers over the period 2002-2006 and recovery after that. Further, we find that catering incentive matters for explaining the unexpected percentage of dividend payouts, if we do not control for risk or liquidity. However, once we control the propensity with risk or liquidity, the significant explanatory power of dividend premium disappear. This indicates that the catering proxy measures the risk/liquidity difference between dividend payers and non-dividend payers. That is, the significance of the dividend premium is because it acts as a proxy for risk, not because it captures investors' demand for dividends.

The third contribution of this Chapter is that we examine stock dividend payment pattern and the determinants of stock dividend payments in China. This is the first study, to the best of our knowledge, to investigate stock dividend payment pattern.

Also, this is the first paper to adopt stock dividend premiums to test the catering theory for stock dividends. We find that the percentage of stock dividend payers in China has decreased dramatically, from 13.82% in 1999 to 2.36% in 2013. Also, our results show that state-owned firms are less likely to pay stock dividends. Meanwhile, we find that risk is negatively related with the probability of being a stock dividend payer, while liquidity measured by stock turnover is positively correlated with stock dividend payment in China over our sample period. Further, we test the applicability of catering theory to stock dividend payouts in China. We find little support for the hypothesis that changes in stock dividend payment pattern reflect firms' catering to investors' preference for stock dividend payments in China. Absent liquidity or risk controls proxy for the investors' preference in explaining the disappearing stock dividends, but the proxy is insignificant once we control for liquidity or risk.

1.2.3 Liquidity, Variance Risk Premium and Market Returns

The first contribution in this chapter is that we comprehensively investigate the interplay among (il)liquidity, stock market return and variance risk premium. For the return-liquidity relation, we find that illiquidity does not cause stock returns, while stock returns can cause illiquidity. The results show that the liquidity, measured by the illiquidity ratio, follows the past stock market return rather than vice versa for the US market over the period 1992-2010. This indicates that we should include the stock market return to supplement the forecasting test of liquidity. For the relationship between variance risk premium and (il)liquidity, we find that the variance risk premium can cause stock returns and illiquidity, rather than vice versa. Our finding is robust for different sub-samples. The result indicates that we should add the variance risk premium in the forecasting tests of liquidity. Also, the result clarifies the interplay among illiquidity, stock returns and variance risk premium: variance risk premium leads to the stock market return and illiquidity, and stock market return leads to liquidity. Thus the traditional view that illiquidity predicts future stock returns may be simply serendipitous. Since variance risk premium, measuring investors' risk aversion to volatility risk, affects stock market return and then the illiquidity, illiquidity contains information about the variance risk premium and thus indirectly impacts the stock market return.

The second contribution of this chapter is that we test the forecasting power of (il)liquidity and the variance risk premium for excess stock market returns. We find that the variance risk premium rather than (il)liquidity can significantly enhance the predictive power of the benchmark model. This indicates that the variance risk premium rather than (il)liquidity contains useful information for forecasting future stock market returns. Moreover, in order to study how the variance risk premium/(il)liquidity are related to the US equities returns, we investigate the relation between the variance risk premium/(il)liquidity and the risk factors, specifically the Fama-French three factors and the momentum factor. The Granger-causality investigation shows that market (il)liquidity cannot cause movement in the four risk factors, but the market risk premium and momentum do cause variations in (il)liquidity. The results also show that the variance risk premium Granger-causes the market risk premium, value factor and momentum factor. That is, the variance risk premium affects the equity returns via these risk factors.

1.3 Organization of the Research

This thesis comprises five chapters. The structure of the thesis is as follows:

Chapter 2: What drives the disappearing dividends phenomenon? In Chapter 2, we study the determinants of dividend payout policy and examine the role of liquidity, risk and catering in explaining the changes in propensity to pay, with samples covering eighteen countries over the period 1989-2011.
Chapter 3: Investor Incentives: Corporate Governance and Dividend policy. In this chapter, we examine the impact of shareholders, managers and board on both the cash dividend payout policy and stock dividend payout policy in China over the sample period 1999-2013.
Chapter 4: Illiquidity, Variance Risk Premium and Stock Returns. In Chapter 4, we comprehensively investigate the interplay among (il)liquidity, variance risk premium and stock returns using monthly US data from Jan 1992 to Dec 2010.
Chapter 5: Conclusion. In the final chapter we summarize the results of this study and suggest avenues for future research.

Chapter 2 What Drives the Disappearing Dividends Phenomenon?

We study the determinants of dividend payout policy and examine the role of liquidity, risk and catering in explaining the changes in propensity to pay. Our results indicate that risk plays a major role in firms' dividend policy. The evidence substantiates from a large sample of firms representing eighteen countries over the sample period from 1989 to 2011. For firms in the US, France, UK and Other European markets, liquidity is additionally an important determinant of dividend policy. We find that, although catering incentives persist only among firms in common law countries and not in civil law countries, after adjusting for risk there is little support for catering theory even among firms incorporated in common law countries. Our results indicate that catering incentives reflect the risk-reward relationship in the changing propensity to pay dividends.

Chapter 2 What Drives the Disappearing Dividends Phenomenon?

2.1 Introduction

"The harder we look at the dividends picture, the more it seems like a puzzle, with pieces that just do not fit together." (Black, 1976, pp.8)

Although research on dividends has proliferated over the last decade, dividend policy remains an open "puzzle" as stated in Black (1976). In fact, Miller and Modigliani (1961) put forward dividend irrelevance theory, which postulates that dividend policy does not matter when enhancing shareholders' wealth in a frictionless market. Research has since followed with several possible explanations as to why some firms pay dividends and others do not in a market driven by imperfections. Most of the literature focuses on the determinants of dividend policy and the impact of dividend policy on stock price; few study the time-trends in dividend payments. Fama and French (2001) observe the incidence of dividend payments by firms listed on NYSE, AMEX, and NASDAQ over the period 1926-1999 and find that the percentage of dividend payers declined significantly from 66.5% in 1978 to 20.8% in 1999. They suggest that the swelling of newly listed small firms with low profitability and great investment opportunity during that period could explain the decreasing dividends. However, even after controlling for those firm characteristics such as size, profitability and investment opportunity, the percentage of dividend payers between 1978 and 1999 still presents a dramatic decline pattern. This phenomenon of unexplained percentage of declining dividend payers is termed the "disappearing dividends puzzle" by Fama and French (2001).

Subsequently, a number of studies advance possible explanations for the disappearing dividends phenomenon. DeAngelo et al. (2006) provide a life-cycle explanation for the evidence observed by Fama and French (2001) and Grullon et al. (2002), whereby mature firms (firms with a higher proportion of retained earnings to total equity) are more likely to pay dividends than young firms with high investment opportunities and limited resources. The existence of the life-cycle effect is empirically supported by Denis and Osobov (2008) and Ferris et al. (2009). Baker and Wurgler (2004a) advocate a possible behavioral explanation to the unexpected fall in the percentage of dividend payers, known as catering theory. Based on the theory of investment sentiment, Baker and Wurgler (2004a) suggest that managers execute the dividend policy that caters to irrational investors' demand to boost their stock price above the fundamentals (see Baker and Kolb, 2009). They choose to pay dividends when investors prefer dividend payers; likewise, they omit dividends when investors put a discount on dividend payers.

The empirical evidence for the presence of catering theory is rather inconclusive. With respect to US evidence, studies find that catering incentives explain the declining propensity to pay (Baker and Wurgler, 2004b; Hsieh and Wang, 2006; Neves et al., 2006; Ali and Urcan, 2012 and Kale et al., 2012). However, Julio and Ikenberry (2004) and Hoberg and Prabhala (2009) find no evidence for the presence of catering incentives among US firms. For the UK market, Ferris et al. (2006) identify a remarkable decline in the portion of dividend payers, from 75.9% in 1988 to 54.5% in 2001, and report that after considering firm characteristic variables, catering incentives still hold significant explanatory power over the changes in propensity to pay. Contradictory to this, Denis and Osobov (2008) find that catering incentives are insignificantly associated with the declining dividend payouts among UK firms. The international evidence on the presence of catering theory is similarly mixed and inconclusive (see Savov and Weber, 2006; Renneboog and Szilagyi, 2007; Eije and Megginson, 2008; Denis and Osobov, 2008; Ferris et al., 2009; among others).

Meanwhile, liquidity and risk factors have been advanced recently as possible explanations of the puzzle in the US market. Banerjee et al. (2007) provide evidence for the link between liquidity and dividend policy using a large sample of firms from AMEX and NYSE over a 40-year period from 1963 to 2003. They adopt turnover ratio, illiquidity ratio, trading volume, and proportion of days with no trading as liquidity measures and conclude that liquidity holds pronounced explanatory power in dividend payout policy after controlling for firm characteristics. This corroborates the evidence found by Bulan et al. (2007) that the incidence of dividend initiations is relatively higher for firms with higher illiquidity. However, they show that the change in illiquidity is not a significant predictor of firms' dividend initiations. Hoberg and Prabhala (2009) study the relationship between risk and dividend policy for US firms between 1963 and 2004 and find that both systematic and idiosyncratic risks could explain the disappearing dividends puzzle. They report that risk could explain roughly 40% of the decreasing incidence in dividend payers observed. Moreover, they argue that, after accounting for risk, the explanatory power of catering incentives disappears for the US market. That is, the dividend premium, proxy for catering incentives, actually measures the risk difference between dividend payers and non-payers. Nevertheless, this argument contradicts Bulan et al.'s (2007) evidence that catering incentives are significantly associated with fluctuations in the idiosyncratic risk-adjusted propensity to pay.

The presence of liquidity and risk-based explanations of dividend payout policy have only been examined (albeit separately) among US firms. Hence this study attempts to bridge a noticeable gap in the literature and examine the determinants of dividend payout policies across a large sample of firms representing 18 countries (amalgamated into 9 major financial markets), over the period 1989-2011. More specifically, we extend the literature by examining whether liquidity and/or risk can explain dividend policy across several financial markets. Further, this is the first study, to the best of our knowledge, that examines whether declining propensity to pay among firms can be explained by stock market liquidity. Banerjee et al. (2007) study the link between liquidity and dividend policy but do not test for the role of liquidity in explaining changes in the propensity to pay dividends. Furthermore, we explore the life-cycle, risk and catering explanations to the changes in propensity to pay. In this, we internationally substantiate the evidence from the US market for the risk-based explanation of catering, advocated by Hoberg and Prabhala (2009), as the initial presence of catering among US firms is weak[2].

Theoretically, stock liquidity and the likelihood of firms paying dividends are negatively related. As rational investors prefer firms with high liquidity, they impose high discount rates when evaluating firms with low liquidity, thereby lowering their valuations on such firms. In order to raise their valuations, firms with low liquidity are more likely to pay dividends. To investigate this hypothesis, we employ several liquidity measures including turnover ratio, Amihud's (2002) illiquidity ratio, relative bid-ask spread and Liu's (2006) liquidity measure, thereby capturing the different dimensions of liquidity. The turnover ratio captures the trading quantity dimension, Amihud's (2002) illiquidity ratio captures the price impact dimension, relative bid-ask spread captures the trading costs dimension, and Liu's (2006) liquidity measure is constructed to capture the three dimensions of liquidity, namely trading quantity, trading cost and trading speed. Unlike evidence from the US (Banerjee et al., 2007), we find that the traditional liquidity measures - illiquidity ratio and relative bid-ask spread - do not explain the dividend payout policy in most markets. However, turnover ratio and Liu's liquidity measure significantly explain the probability of a firm being a dividend payer, with turnover ratio highly significant for all nine financial markets. This means that the trading quantity dimension of liquidity significantly explains the propensity to pay dividends. When considering the liquidity effect along with risk, we find the effect of liquidity is significant in the case of US, France, UK and Other European markets. Hence for these markets, liquidity is additionally an important determinant of dividend policy, along with risk. Across the nine markets considered in our sample, the average marginal effects show that risk explains 14% to 33% and liquidity explains 4% to 11% of the firms' probability of paying dividends. Thus risk is a primary determinant of dividend policy. Further, we test for the presence of the life-cycle effect (advocated by DeAngelo et al., 2006) among firms in our sample of countries and find support for the life-cycle explanation across all markets. The firm-specific and market-driven risk variables

[2] Hoberg and Prabhala (2009) find that the significance of dividend premium (as a proxy for catering) is weak in several model specifications for the out-of-sample changes in propensity to pay dividends. Our results corroborate this phenomenon.

remain strongly significant, even after accounting for the effects of the firms' life-cycle and liquidity.

Finally, we reexamine the validity of the catering hypothesis after adjusting the propensity to pay with the key determinants such as risk, liquidity, and life-cycle effect. We find that catering incentives have a significantly positive impact on the changes in the unpredicted proportion of dividend payers for firms operating in common law countries including Canada, Hong Kong, Singapore, Australia and UK in our sample. The result is insignificant for the case of firms operating in the US and in civil law countries including France, Germany and Other European. Our results corroborate with Ferris et al. (2009) in that countries with greater investor protection (common law countries) are more responsive to the changing investor preferences and therefore significant catering occurs in such countries. The existence of catering incentives is still significant when the changes in propensity to pay are adjusted for liquidity or life-cycle effect. However, when adjusting the propensity to pay for risk, we find little evidence for the existence of catering incentives, even among the common law countries. Our results indicate that the role of catering reflects the risk-reward relationship in the changing propensity to pay dividends. In other words, catering incentives actually capture the risk difference between firms that pay dividends and firms that do not. Our evidence corroborates Hoberg and Prabhala's (2009) findings in the US market and reveals that the risk-based explanation of the catering phenomenon persists across several financial markets.

The remainder of this paper is organized as follows. Section 2 presents the sample selection and data description. In Section 3 we examine the role of liquidity, life-cycle effect and risk in explaining the probability of being a dividend payer. Section 4 reexamines the validity of the catering hypothesis after accounting for the key determinants of dividend policy. Section 5 concludes.

2.2 Sample Selection and Data Description

2.2.1 Sample Selection

Our sample covers a large number of firms representing eighteen countries, clustered into nine major financial markets including Canada, US, Hong Kong, Singapore, Australia, France, Germany, UK and Other European.[3] The Other European market includes firms operating in Austria, Belgium, Denmark, Finland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and Sweden pooled together. We pool these ten countries into a single European market group (similar to Eije and Megginson, 2008) since these markets have small numbers of firms and have historically been members of the European Union throughout the sample period. According to the legal regime classification of La Porta et al. (1998), six countries in our sample (Canada, US, Hong Kong, Singapore, Australia and UK) belong to the common law regime, while the remaining twelve countries are identified as part of the civil law regime.[4]

Our overall sample period extends from 1989 to 2011. We begin our sample period at 1989, as prior to 1989, data for constructing the liquidity and life-cycle variables are sparse in many countries. Several international studies such as Denis and Osobov (2008) and Eije and Megginson (2008) consider firm-level information from 1989 for similar data unavailability reasons. We retrieve all annual firm-level financial and accounting information from Worldscope (except for the case of US firms). Specifically, we obtain annual financial information on dividends per share, market-to-book value, earnings per share, assets per share, net debt, total equity, ratio of retained earnings to book value of equity, total assets and market capitalization. We require the total assets figures to be available both in the current and in the preceding fiscal year. All the other items must be available in the current fiscal year. To compute the liquidity and risk measures, we acquire daily information on closing stock price, turnover by

[3] Following Denis and Osobov (2008) and Ferris et al. (2009), we exclude Japan since the transitory earnings problems can be a significant factor causing the decline in the percentage of dividend payers.
[4] Future research could study the disappearing dividend puzzle with Klerman et al's (2011) classification.

volume, number of shares outstanding, bid price and ask price. Analogous financial and accounting information for firms belonging to the US are obtained from the Compustat annual files and the Center for Research in Security Prices (CRSP). Following the screening criteria used by Fama and French (2001), we restrict our US sample to publicly traded common securities on the NYSE, AMEX, and NASDAQ stock exchanges with the CRSP share codes of 10 or 11. The sample and variables construction for the US used in this paper are similar to that of Hoberg and Prabhala (2009). Financial firms (SIC Codes 6000-6999) and utility firms (SIC Codes 4900-4949) are excluded from the list of firms. To avoid any survivorship bias, we include both active and dead firms in our sample.

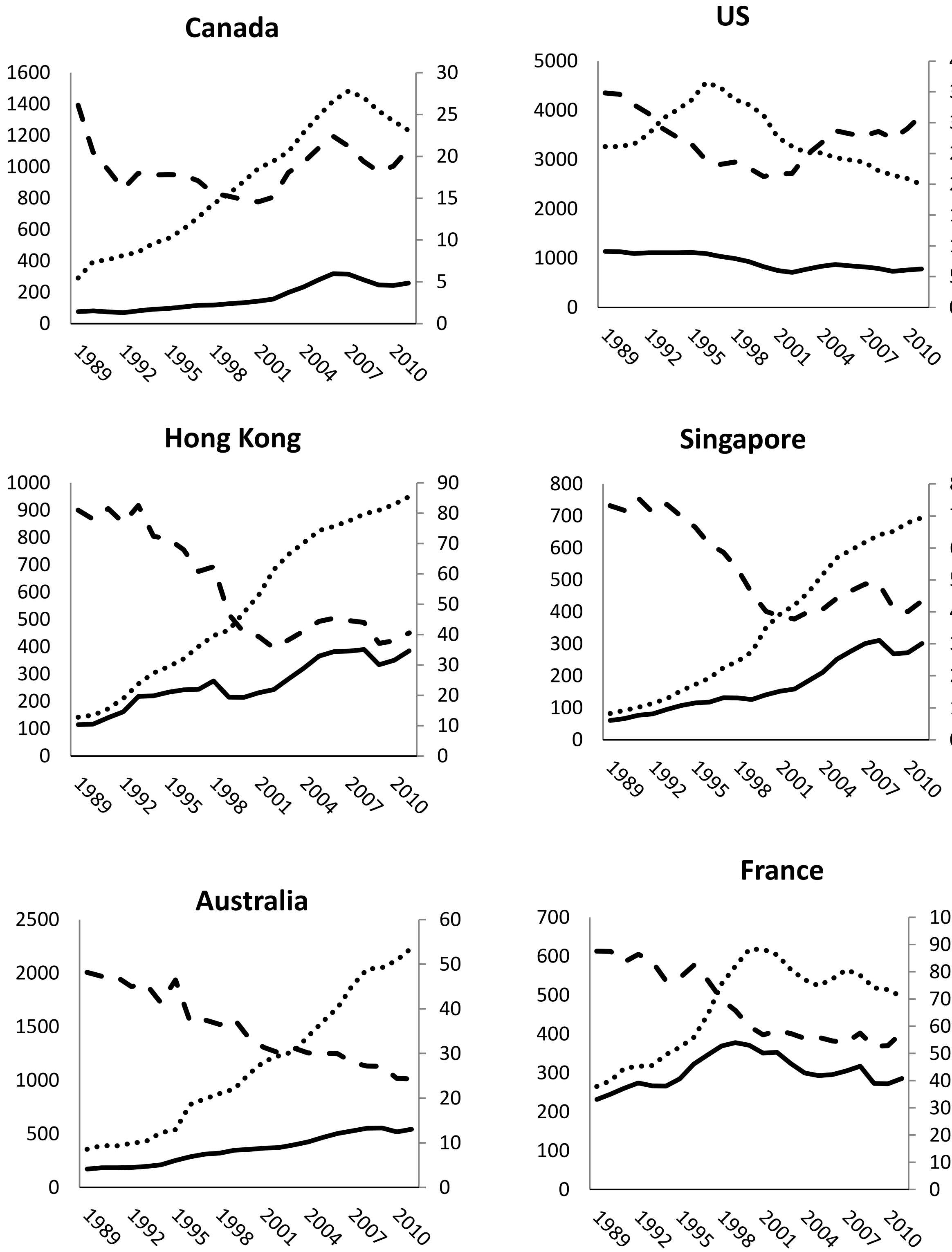
2.2.2 Data Description

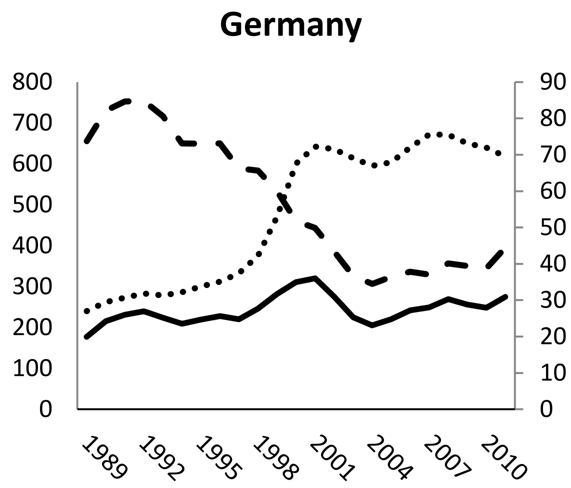
Table 2.1 and Figure 2.1 show the number of firms, number of dividend payers, and the percentage of dividend payers during the period from 1989 to 2011 for all the selected markets in this study. We can clearly observe two distinctive features in the dividend payout patterns among these markets. First, we see that the percentage of dividend payers decreases during the sample period 1989-2011 by between 30% and 50% for most of the markets, while the percentage of dividend payers recovers in the case of Canada and US. It is notable that the percentage of dividend payers increases substantially from 2001 in the US market, although it is still 4% lower in 2011 than the 1989 level. More specifically, the percentage of US dividend payers follows a significant upward trend during 2001-2011, rising from 22% in 2001 to 31% in 2011. A similar phenomenon is documented by Julio and Ikenberry (2004) for the US market during the period 2001-2004. The recovery in the proportion of dividend-paying groups is also observed in the Canadian market, which increases from 15% in 2001 to 22% in 2006. However, after 2006, it declines again and falls to a lower level of 19% in 2010. By contrast, the dividend payment patterns in the Hong Kong, Singapore, Australia, France, Germany, UK and Other European show a generally downward trend with some fluctuations over our sample period of 23 years.

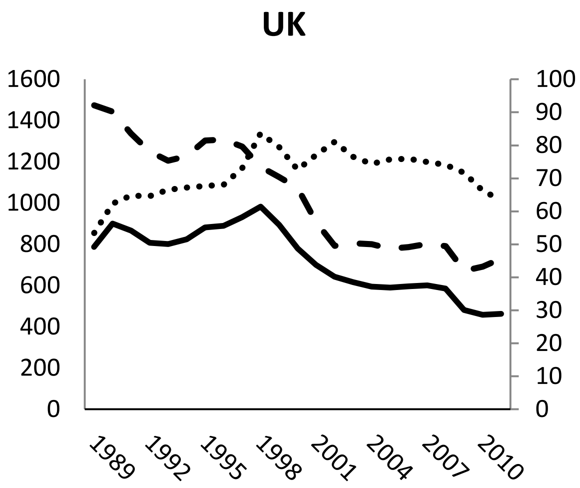
Table 2.1: Number of Dividend Payers (P), Non-Payers (NP) and Total Number of Firms (To) by Country, over the Period 1989-2011. The sample includes non-financial and non-utility firms in the Worldscope database for the financial markets Canada, US, Hong Kong, Singapore, Australia, France, Germany, UK and other European that satisfy the data availability requirements. The US sample includes firms on NYSE, AMEX and NASDAQ with available information in Compustat annual files and CRSP. A firm is a dividend payer if it has a positive dividend per share; otherwise the firm is classified as a non-payer.

Year	Canada			US			Hong Kong			Singapore			Australia			France			Germany			UK			Other European		
	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP
1989	1.87	2.66	-15.30	1.38	1.45	-4.68	1.42	2.57	-25.80	2.71	5.83	-33.19	1.55	1.77	-5.85	2.48	0.91	43.65	2.02	3.13	-18.97	1.88	2.94	-44.76	1.36	1.55	-5.51
1990	1.86	2.12	-5.69	1.31	1.33	-1.75	2.19	1.83	7.70	2.72	5.46	-30.21	1.45	1.96	-13.17	1.79	2.21	-9.08	2.68	3.13	-6.69	1.56	2.52	-47.99	1.49	2.82	-27.67
1991	1.68	2.50	-17.16	1.44	1.52	-5.00	1.60	1.65	-1.54	2.27	2.66	-6.85	1.33	8.94	-82.65	1.42	1.82	-10.77	2.08	3.02	-16.25	1.92	2.89	-41.15	0.98	1.11	-5.31
1992	1.63	2.39	-16.61	1.49	1.55	-4.03	1.97	1.48	12.49	1.93	1.65	6.86	1.55	2.22	-15.54	1.43	1.04	13.84	1.91	2.74	-15.79	1.70	2.95	-55.37	0.75	0.87	-6.70
1993	1.81	2.58	-15.50	1.53	1.67	-8.68	2.09	2.97	-15.14	2.28	2.95	-11.17	1.95	3.30	-22.97	1.51	1.07	15.10	1.83	3.56	-28.92	2.13	4.05	-64.15	1.21	0.85	15.14
1994	1.80	2.76	-18.62	1.48	1.55	-4.13	2.02	5.36	-42.38	2.19	3.97	-25.77	2.04	4.28	-32.10	1.85	1.76	2.11	2.10	5.24	-39.72	2.21	3.34	-41.41	1.33	1.79	-13.00
1995	2.18	2.65	-8.56	1.66	1.83	-9.56	1.33	1.73	-11.41	1.79	1.88	-2.09	1.67	2.78	-22.09	1.80	1.56	6.18	2.13	2.95	-14.30	2.35	4.29	-60.19	1.00	1.32	-11.96
1996	1.95	2.81	-15.75	1.74	1.83	-4.66	1.14	1.30	-5.40	1.55	1.83	-7.37	1.74	4.94	-45.29	1.67	3.23	-28.62	2.12	2.16	-0.73	2.65	6.45	-89.03	1.09	1.18	-3.49
1997	2.55	3.23	-10.25	1.97	1.96	0.28	1.70	2.89	-23.08	1.64	2.65	-20.81	2.03	3.83	-27.55	2.38	4.29	-25.51	2.87	3.17	-4.41	3.02	4.97	-49.74	1.85	1.10	22.66
1998	2.31	2.72	-7.04	2.20	2.08	5.41	0.74	1.05	-14.81	0.69	0.99	-15.84	1.55	2.97	-28.35	3.02	3.01	0.12	3.34	3.31	0.45	2.93	4.06	-32.65	3.39	4.55	-12.79
1999	2.62	2.77	-2.38	2.14	2.85	-28.58	1.18	1.02	6.26	1.50	2.31	-18.71	1.79	2.71	-17.98	2.92	2.17	12.79	2.81	5.16	-26.42	2.26	4.35	-65.61	3.06	2.88	2.59
2000	3.52	4.41	-9.77	1.98	2.43	-20.48	0.99	1.42	-15.82	1.10	1.86	-22.72	1.54	2.45	-20.12	2.79	2.36	16.70	2.62	5.88	-35.08	2.34	5.33	-82.18	4.09	4.27	-1.82
2001	2.29	2.31	-0.42	1.84	1.82	1.43	0.93	1.25	-13.05	1.12	0.94	7.57	1.32	1.27	1.73	2.87	2.33	9.13	1.93	1.45	12.28	2.21	1.82	19.30	2.67	2.59	1.35
2002	2.01	2.00	0.09	1.64	1.54	6.35	0.79	0.86	-3.53	1.08	0.93	6.81	1.41	1.28	4.11	2.51	1.74	15.94	1.58	1.46	3.23	1.95	1.31	39.70	1.86	1.75	2.61
2003	1.92	2.03	-2.38	1.74	1.76	-1.21	0.95	0.92	1.60	1.22	1.13	3.11	1.50	1.34	5.13	2.26	2.18	1.40	1.70	1.54	4.25	2.15	1.72	22.43	1.96	2.05	-2.06
2004	2.06	2.41	-6.89	1.73	1.86	-7.04	1.18	1.22	-1.45	1.32	1.15	6.02	1.58	1.72	-3.72	2.23	2.49	-4.91	1.90	1.58	8.05	2.28	1.48	43.13	2.11	3.03	-15.73
2005	2.49	2.36	2.36	1.68	1.94	-14.13	1.26	1.19	2.59	1.28	1.08	7.27	1.90	1.64	6.37	2.23	2.35	-2.34	1.81	1.46	9.36	2.59	2.89	-11.17	2.48	2.39	1.64
2006	2.37	2.25	2.14	1.74	1.92	-9.70	1.26	1.21	1.60	1.26	1.07	7.08	1.74	1.73	0.26	2.08	2.39	-6.05	1.82	1.77	1.25	2.77	2.77	0.05	2.53	2.65	-1.94
2007	2.67	2.55	1.95	1.81	1.81	-0.31	1.52	2.05	-12.80	1.68	1.73	-1.42	2.11	2.21	-2.03	2.49	2.35	2.52	2.44	2.40	0.72	2.71	2.47	9.36	3.34	3.10	3.22
2008	2.33	2.08	5.02	1.50	1.36	9.47	1.09	1.24	-5.73	1.26	1.30	-1.66	1.44	1.93	-12.72	1.72	1.64	2.19	1.89	1.93	-1.12	2.07	2.02	2.85	2.19	2.51	-5.90
2009	1.64	1.06	18.96	1.55	1.51	2.27	0.99	0.95	1.85	1.00	0.95	2.44	1.10	1.13	-1.11	1.44	0.74	28.99	1.36	1.31	1.62	2.05	1.52	30.04	1.89	1.65	5.99
2010	1.76	1.55	5.66	1.60	1.67	-4.19	1.15	0.99	6.80	1.13	1.02	4.55	1.39	1.24	5.11	1.60	0.91	24.18	1.67	1.31	10.33	2.05	1.59	25.21	2.21	1.71	11.10
2011	2.12	2.14	-0.58	1.57	1.59	-1.54	1.14	1.02	4.90	1.12	1.02	3.87	1.47	1.53	-1.91	1.66	1.43	6.54	1.87	1.97	-2.34	1.91	1.53	22.00	2.30	2.01	5.81

Figure 2.1: Time Series Plot of Number of Dividends Payers, Total Number of Firms, and the Percentage of Dividends Payers over the Period 1989-2011. In each figure, the solid line is the number of dividends payers, the dotted line is the total number of firms, and the dashed line is the percentage of dividends payers. The sample includes all non-financial and non-utility firms operating in Canada, US, Hong Kong, Singapore, Australia, France, Germany, UK and Other European markets that satisfy the data availability requirements. Firms classified as payers have positive dividends per share. The left vertical axis represents the number of firms and the right vertical axis represents the percentage of dividend payers.




Germany
800
700
600
500
400
300
200
100
0
90
80
70
60
50
40
30
20
10
0
1989
1992
1995
1998
2001
2004
2007
2010


UK
1600
1400
1200
1000
800
600
400
200
0
100
90
80
70
60
50
40
30
20
10
0
1989
1992
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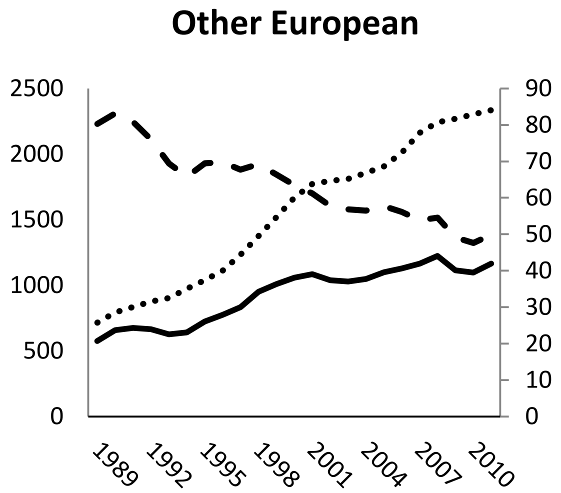
2010


Other European
2500
2000
1500
1000
500
0
90
80
70
60
50
40
30
20
10
0
1989
1992
1995
1998
2001
2004
2007
2010

Further, we observe that the average value of the percentage of dividend payers shows dramatic variations among these countries. Table 2.1 and Figure 2.1 reveal that only 15% of Canadian firms paid dividends in 2001, while in the same year, the percentage of dividend payers is still 61% in the Other European markets. Similar to Canada, the percentage of dividend payers in the US market consistently remains below 35%, with the lowest level of 22% being reached in 2001, followed by an upward trend. For Australia, the proportion of dividend payers is at a level between 48% in 1989 and 24% in 2011. For the other common law markets, namely Hong Kong, Singapore and UK, the dividend payers account for approximately 35% or more over our sample period. With respect to the UK, Table 1 and Figure 1 show that during the period from 1989 to 2002, the percentage of dividend payers among UK firms fall sharply by 43%, with much of the decline being concentrated in the post-1996 period. This is consistent with Ferris et al.'s (2006) study. The figures also reveal that after 2003 the proportion of firms paying dividends continues to decrease and reaches a nadir of 42% in 2009, before increasing to 46% in 2011. A similar pattern can be observed for Hong Kong and Singapore but with a significant increase between 2002 and 2006. For the civil law countries, the proportion of dividend payers is even higher and consistently remains over 50% except in the case of Germany after 2000. Finally, it is worth noting that many of the markets display an increase in the proportion of dividend payers following the financial crisis of 2007, such as Canada, US, Hong Kong, Singapore, France, Germany and UK.

Table 2.2: Market-to-Book Ratio and Dividend Premium, over the Period 1989-2011. The MTB columns report the book-value weighted-average market-to-book ratio for payers (MTB(P)) and non-payers (MTB(NP)) across the sample of countries considered. The dividend premium (DP) is the difference between the log of the book-value weighted-average market-to-book ratio of payers and that of non-payers.

Year	Canada			US			Hong Kong			Singapore			Australia			France			Germany			UK			Other European		
	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP	MTB (P)	MTB (NP)	DP
1989	1.87	2.66	-15.30	1.38	1.45	-4.68	1.42	2.57	-25.80	2.71	5.83	-33.19	1.55	1.77	-5.85	2.48	0.91	43.65	2.02	3.13	-18.97	1.88	2.94	-44.76	1.36	1.55	-5.51
1990	1.86	2.12	-5.69	1.31	1.33	-1.75	2.19	1.83	7.70	2.72	5.46	-30.21	1.45	1.96	-13.17	1.79	2.21	-9.08	2.68	3.13	-6.69	1.56	2.52	-47.99	1.49	2.82	-27.67
1991	1.68	2.50	-17.16	1.44	1.52	-5.00	1.60	1.65	-1.54	2.27	2.66	-6.85	1.33	8.94	-82.65	1.42	1.82	-10.77	2.08	3.02	-16.25	1.92	2.89	-41.15	0.98	1.11	-5.31
1992	1.63	2.39	-16.61	1.49	1.55	-4.03	1.97	1.48	12.49	1.93	1.65	6.86	1.55	2.22	-15.54	1.43	1.04	13.84	1.91	2.74	-15.79	1.70	2.95	-55.37	0.75	0.87	-6.70
1993	1.81	2.58	-15.50	1.53	1.67	-8.68	2.09	2.97	-15.14	2.28	2.95	-11.17	1.95	3.30	-22.97	1.51	1.07	15.10	1.83	3.56	-28.92	2.13	4.05	-64.15	1.21	0.85	15.14
1994	1.80	2.76	-18.62	1.48	1.55	-4.13	2.02	5.36	-42.38	2.19	3.97	-25.77	2.04	4.28	-32.10	1.85	1.76	2.11	2.10	5.24	-39.72	2.21	3.34	-41.41	1.33	1.79	-13.00
1995	2.18	2.65	-8.56	1.66	1.83	-9.56	1.33	1.73	-11.41	1.79	1.88	-2.09	1.67	2.78	-22.09	1.80	1.56	6.18	2.13	2.95	-14.30	2.35	4.29	-60.19	1.00	1.32	-11.96
1996	1.95	2.81	-15.75	1.74	1.83	-4.66	1.14	1.30	-5.40	1.55	1.83	-7.37	1.74	4.94	-45.29	1.67	3.23	-28.62	2.12	2.16	-0.73	2.65	6.45	-89.03	1.09	1.18	-3.49
1997	2.55	3.23	-10.25	1.97	1.96	0.28	1.70	2.89	-23.08	1.64	2.65	-20.81	2.03	3.83	-27.55	2.38	4.29	-25.51	2.87	3.17	-4.41	3.02	4.97	-49.74	1.85	1.10	22.66
1998	2.31	2.72	-7.04	2.20	2.08	5.41	0.74	1.05	-14.81	0.69	0.99	-15.84	1.55	2.97	-28.35	3.02	3.01	0.12	3.34	3.31	0.45	2.93	4.06	-32.65	3.39	4.55	-12.79
1999	2.62	2.77	-2.38	2.14	2.85	-28.58	1.18	1.02	6.26	1.50	2.31	-18.71	1.79	2.71	-17.98	2.92	2.17	12.79	2.81	5.16	-26.42	2.26	4.35	-65.61	3.06	2.88	2.59
2000	3.52	4.41	-9.77	1.98	2.43	-20.48	0.99	1.42	-15.82	1.10	1.86	-22.72	1.54	2.45	-20.12	2.79	2.36	16.70	2.62	5.88	-35.08	2.34	5.33	-82.18	4.09	4.27	-1.82
2001	2.29	2.31	-0.42	1.84	1.82	1.43	0.93	1.25	-13.05	1.12	0.94	7.57	1.32	1.27	1.73	2.87	2.33	9.13	1.93	1.45	12.28	2.21	1.82	19.30	2.67	2.59	1.35
2002	2.01	2.00	0.09	1.64	1.54	6.35	0.79	0.86	-3.53	1.08	0.93	6.81	1.41	1.28	4.11	2.51	1.74	15.94	1.58	1.46	3.23	1.95	1.31	39.70	1.86	1.75	2.61
2003	1.92	2.03	-2.38	1.74	1.76	-1.21	0.95	0.92	1.60	1.22	1.13	3.11	1.50	1.34	5.13	2.26	2.18	1.40	1.70	1.54	4.25	2.15	1.72	22.43	1.96	2.05	-2.06
2004	2.06	2.41	-6.89	1.73	1.86	-7.04	1.18	1.22	-1.45	1.32	1.15	6.02	1.58	1.72	-3.72	2.23	2.49	-4.91	1.90	1.58	8.05	2.28	1.48	43.13	2.11	3.03	-15.73
2005	2.49	2.36	2.36	1.68	1.94	-14.13	1.26	1.19	2.59	1.28	1.08	7.27	1.90	1.64	6.37	2.23	2.35	-2.34	1.81	1.46	9.36	2.59	2.89	-11.17	2.48	2.39	1.64
2006	2.37	2.25	2.14	1.74	1.92	-9.70	1.26	1.21	1.60	1.26	1.07	7.08	1.74	1.73	0.26	2.08	2.39	-6.05	1.82	1.77	1.25	2.77	2.77	0.05	2.53	2.65	-1.94
2007	2.67	2.55	1.95	1.81	1.81	-0.31	1.52	2.05	-12.80	1.68	1.73	-1.42	2.11	2.21	-2.03	2.49	2.35	2.52	2.44	2.40	0.72	2.71	2.47	9.36	3.34	3.10	3.22
2008	2.33	2.08	5.02	1.50	1.36	9.47	1.09	1.24	-5.73	1.26	1.30	-1.66	1.44	1.93	-12.72	1.72	1.64	2.19	1.89	1.93	-1.12	2.07	2.02	2.85	2.19	2.51	-5.90
2009	1.64	1.06	18.96	1.55	1.51	2.27	0.99	0.95	1.85	1.00	0.95	2.44	1.10	1.13	-1.11	1.44	0.74	28.99	1.36	1.31	1.62	2.05	1.52	30.04	1.89	1.65	5.99
2010	1.76	1.55	5.66	1.60	1.67	-4.19	1.15	0.99	6.80	1.13	1.02	4.55	1.39	1.24	5.11	1.60	0.91	24.18	1.67	1.31	10.33	2.05	1.59	25.21	2.21	1.71	11.10
2011	2.12	2.14	-0.58	1.57	1.59	-1.54	1.14	1.02	4.90	1.12	1.02	3.87	1.47	1.53	-1.91	1.66	1.43	6.54	1.87	1.97	-2.34	1.91	1.53	22.00	2.30	2.01	5.81

Table 2.2 presents the book-value weighted-average market-to-book ratio for payers and non-payers as well as the corresponding dividend premium for each year from 1989 to 2011 for the markets considered in this study. Following the definition given by Baker and Wurgler (2004a, 2004b), dividend premium, estimated as the difference between the log of the book-value weighted-average market-to-book ratio for dividend payers and that of non-payers, can proxy investors' preference for dividend payers and capture the presence of possible catering incentives. It is clear that the dividend premium fluctuates and contains a mixture of positive and negative values among all the sample countries. For most markets we see that, prior to 2001, the book-value weighted-average market-to-book ratio for dividend payers is less than that of non-payers, with the spread noticeably decreasing after 2001 for the case of six out of nine markets. These six markets include the five common law countries (Canada, Hong Kong, Singapore, Australia and UK) and Germany. Overall, for all markets, dividend premiums appear to become less negative after 2001. Before 2001, we observe the largest negative premium of -89.03 for the UK in 1996 (followed by -82.65 for Australia). The largest negative dividend premium after 2001 is -15.73 for Other European markets (followed by -14.13 for the US). For the case of US, we see that dividend premium is negative in most years (even though we observe, in Figure 1, an increase in the percentage of dividend payers after 2001). Denis and Osobov (2008) report similar negative values of dividend premium for the US. This reflects into the lack of catering effect we find in Section 4 (Table 2.6). Hoberg and Prabhala (2009) also find limited evidence of the catering hypothesis for the US.

2.3 Determinants of Dividend Payout Policy

Following Fama and French (2001), we employ a logit model to examine the role of liquidity and risk factors in explaining the probability of paying dividends. The logit regression takes the following form:

$$y_{it} = logit\ \left(a + b\frac{M}{B}_{it} + c\frac{dA}{A}_{it} + d\frac{E}{A_{it}} + \ eSIZE_{it} + f\frac{D}{E_{it}} + g\frac{RE}{BE_{it}} + hLiq_{it} + iSYS_{it} + jID_{it}\right) + \mu_{it} \qquad (1)$$

where y_{it} is set to one when firm *i* pay dividends in year t, and zero otherwise. The coefficients of the model are estimated as time series averages of Fama and MacBeth's (1973) annual cross-sectional regressions with Newey-West t statistics. The independent variables in this logit model can be categorized into four groups: a.) the Fama and French (2001) firm characteristic variables (market-to-book ratio (M/B_{it}), asset growth (dA/A_{it}), earnings-to-assets ratio (E/A_{it}), and size percentile ($SIZE_{it}$)) and leverage proxied by the debt-to-equity ratio (D/E_{it}); b.) the life-cycle variable proxied by the ratio of retained earnings to book value of equity (RE/BE_{it}); c.) the liquidity variable (Liq_{it}) proxied by four different liquidity measures, namely turnover ratio (ToR_{it}), illiquidity ratio ($ILLIQ_{it}$), relative bid-ask spread (PS_{it}) and Liu's (2006) liquidity measure (LM_{it}); and d.) the risk variables including systematic risk (SYS_{it}) and idiosyncratic risk (ID_{it}). Below we explain the variables used in the logit regression. For the liquidity coefficients, we predict a negative sign for *ToR* and positive signs for *ILLIQ*, *PS* and *LM*. For the risk variables *SYS* and *ID*, we predict the slope coefficients to have negative signs.

2.3.1 Firm Characteristic Variables and Leverage

Fama and French (2001) point out a significant relation between dividend policy and firm characteristic variables including size, profitability, and investment opportunities. Larger and more profitable firms are more likely to pay dividends. Further, dividend payments are less likely to be made by firms with more investments. Thus, to investigate the determinants of the dividend payout trends, we include in our analysis size, profitability and investment opportunity variables, as defined in Fama and French (2001). Size characteristics are captured by the market capitalization percentile ($SIZE_{it}$). This variable is calculated as the fraction of firms with equal or smaller market value than firm *i* in a given year *t*.[5] Earnings-to-assets ratio is considered as a proxy for profitability and the measure of a firm's investment opportunity is constructed with market-to-book value and asset growth, which is the proportionate change in total assets for year *t*. Additional to the four basic Fama and French (2001) firm characteristic variables, since leverage ratio can impact a firm's dividend policy (Neves et al., 2006), we include the debt-to-equity ratio, as a proxy for leverage, in our analysis.

2.3.2 Life-cycle Variable

DeAngelo et al. (2004) find that dividends in the US tend to be more concentrated among a small number of large payers. To explain this phenomenon, DeAngelo et al. (2006) advance the life-cycle theory, where firms adopt the optimal dividend policy in accordance with the evolution of their opportunity set. In the early years, firms pay fewer dividends as their investment opportunities exceed their internally generated capital. Conversely, in the later years, firms pay more dividends to mitigate the possibility of free cash flows being wasted due to internal funds exceeding investment opportunities. The life-cycle theory is empirically evidenced by DeAngelo et al. (2006), who use earned-to-contributed equity mix to proxy for a firm's life-cycle stage. This proxy measures the proportion of the internally generated, to firm's contributed, capital and is calculated as the ratio of retained earnings to the book value of equity (RE/BE). DeAngelo et al. (2006) and Denis and Osobov (2008) find a positive link between the propensity to pay dividends and the firms' earned-to-contributed equity mix. Hence we incorporate this variable to study the corporate dividend payout practice.

[5] For the ten countries pooled together to form the Other European market, the market capitalization percentile is computed for each country separately.

2.3.3 Liquidity Factor

Banerjee et al. (2007) find that liquidity could in part account for the changes in dividend payers. In markets with low liquidity, high transaction costs influence investors to receive dividends rather than acquire the same amount of homemade dividends by selling their investment. Meanwhile, rational investors prefer liquid stocks and lower the valuation of illiquid stocks. Thus firms with low liquidity would more likely pay dividends to increase their valuation. This is empirically evidenced by Banerjee et al. (2007) with a large sample of US data over the period 1963-2003. Their findings are consistent with Bulan et al.'s (2007) observation that dividend initiations occur more frequently in illiquid markets.

Thus, the liquidity variable is applied to test the prediction that stock liquidity is negatively related to dividend payment decisions. In this study, we adopt four proxies for liquidity. The first is turnover ratio (*ToR*), defined as the volume of shares traded scaled by the number of shares outstanding, and is an alternative widely-used proxy for liquidity which focuses on the trading quantity dimension of liquidity. The second liquidity measure is the illiquidity ratio (ILLIQ) put forward by Amihud (2002). He uses this measure to proxy for price impact of a trade, which is defined as the average of the ratio of daily absolute return to the daily volume:

$$ILLIQ_i = \frac{1}{D_i}\sum_{d=1}^{D_i}\frac{|R_{id}|}{VOLD_{id}} \qquad (2)$$

where R_{id} is the return on stock *i* on day *d*, $VOLD_{id}$ is the corresponding daily trading value, and D_i is the number of days with data available for stock *i* during the pre- and post-addition measurement periods. The third liquidity proxy is the relative bid-ask spread (*PS*), which is defined as the difference between the bid and ask price, and normalized by stock price. This proxy is first used by Amihud and Mendelson (1986), who state that an asset with higher relative bid-ask spread has a longer holding horizon, and thus less trading activity and lower liquidity.

The fourth measure of stock liquidity is the standardized turnover-adjusted number of zero daily trading volumes. This liquidity measure (*LM*) put forward by Liu (2006) is defined as the standardized turnover-adjusted number of zero daily trading volumes over the previous 12 months. Specifically, this liquidity measure is calculated using the following equation:

$$LM = \left[NoDV + \frac{\frac{1}{12\_month\ turnover}}{Deflator} \right] \times \frac{21\text{x}12}{NoTD} \qquad (3)$$

where *NoDV* denotes the number of zero daily volumes in previous 12 months, *12_month turnover* is the sum of daily turnover over the previous 12 months, and *NoTD* is the total number of trading days in the market over the previous 12 months. The second term in the brackets is the turnover adjustment, which distinguishes two stocks with the same integer number of zero daily trading volumes. High values of *LM* are associated with illiquid stocks that tend to be small, value, low-turnover stocks with large bid-ask spreads and high return-to-volume ratios. As in Liu (2006), we multiply $21 \text{ x } 12\ /NoTD$ in order to standardize the number of trading days in a month to 21 in order to make the liquidity measure comparable over time. Liu defines liquidity as the "ability to trade large quantities quickly with little price impact at low cost" (Liu, 2006). Thus compared with the other three liquidity measures, Liu's liquidity proxy captures the multidimensional features of liquidity – trading quantity, trading speed and trading cost (see Liu, 2006 for details).

In estimating *ToR*, *ILLIQ* and *LM*, we require an accurate measurement of trading volume. Atkins and Dyl (1997) and Anderson and Dyl (2005) suggest a correction factor to account for the over-counting of trading volume in dealer markets. Hence we adjust the trading volume for stocks trading on the NASDAQ in the US market and stocks from four countries included in the Other European market (namely, Denmark, Finland, Italy and Sweden) that are primarily dealer markets. For stocks listed on the NASDAQ, we estimate a correction factor of 0.62. This is calculated as the median decline in the trading volume of stocks that switch from NASDAQ to NYSE/AMEX.[6] For the Other European markets, we are unable to compute the correction factor using Atkin and Dyl's (1997) method, since there is no stock switching information in these countries. Hence we apply the correction factor of 0.62 that is found from the US market.[7]

2.3.4 Risk Factor

Studies on the relationship between risk and dividend policy indicate a negative relationship between risk and dividend payments. One strand of literature builds on the maturity theory proposed by Venkatesh (1989), which finds firm maturity, characterized by less risk, is able to motivate firms to pay dividends. This theory is supported by Grullon et al.'s (2002) work. Through investigating announcements of dividend reductions and increases by NYSE and AMEX listed firms over the period 1982 to 1993, Grullon et al. (2002) find that dividend changes are accompanied by changes in systematic risk, and increases in dividends lead to a decline in firms' systematic risk. Similar results are reported by Koch and Sun (2004). Moreover, Fama and French (2001) suggest that the disappearing dividends puzzle over the period from 1978 to 1998 could be partly explained by the changes in firm characteristics over that period, with one of the pronounced changes being the decrease in the profitability of newly listed small firms during the same period. Thus it could be inferred that the increase in the risk level of newly listed firms partly leads to the decrease in the incidence of dividend payers. Based on a large sample of US data from 1963 to 2000, Pastor and Veronesi (2003) argue that the increase in idiosyncratic risk prevailing in the 1990s is accompanied by the rise in cash flow risk, which is supposed to limit a firm's dividend payments. Meanwhile, Malkiel and Xu (2003) posit that the increased firm-specific risk

[6] In more detail, we calculate the percentage drop as the change in the overall average daily trading volume between the forty-day periods preceding and following the switching date (see Atkins and Dyl, 1997 for details). We identify that during our sample period 1989-2012, 485 of our sample firms switch from NASDAQ to NYSE and 290 of our sample firms switch from NASDAQ to AMEX. We find the median percentage drop for the 775 stocks that switched from NASDAQ to NYSE/AMEX to be 0.38, which corresponds to a correction factor of 0.62.

[7] For robustness, we reconsider all the empirical analysis in Sections 3.5 and 4 by removing NASDAQ firms from our US sample. Also, we consider using the unadjusted volume information for the Other European markets. The empirical results remain materially unchanged and hence the volume adjustments do not affect our results.

reflects a firm's growth potential in the future, indicating that firms with increased idiosyncratic risk may decrease their dividend payments for the sake of future growth.

In a recent paper, Hoberg and Prabhala (2009) analyze a large sample of US data from 1963 to 2004, pointing out that both systematic and idiosyncratic risks have significant explanatory power for the disappearing dividends puzzle. They find that risk factor, in the US, could explain roughly 40% of the decreasing incidence of dividend payers. In order to examine the role of risk factors in explaining dividend policy, our analysis includes systematic risk and idiosyncratic risk variables. Following Hoberg and Prabhala (2009), the former is defined as the standard deviation of the predicted value from a CAPM regression while the latter is defined as the standard deviation of residuals from the above regression.

2.3.5 Results of the Logit Regression

To test whether liquidity can explain the likelihood of a firm paying dividends, we use logit regressions that include basic firm characteristic variables and various proxies for liquidity. Table 2.3 reports the estimated coefficients and Newey-West *t*-statistics for the logit regressions. The dependent variable is equal to one if the firm pays dividend that year and zero otherwise. In Panel A we present the estimates from the baseline regression with firm characteristic explanatory variables advanced by Fama and French (2001), while Panel B presents the results from regressions with the firm characteristic variables and the liquidity measures. We include each liquidity measure separately in the regressions as they are highly correlated with each other. For brevity, we report (in Panel B) only the coefficient estimates for the four liquidity variables *ToR*, *ILLIQ*, *PS* and *LM*.[8]

[8] The (unreported) slope estimates for the Fama and French (2001) firm characteristic variables in Panel B are quite similar to those reported in Panel A.

Table 2.3: Logit Estimation with Different Liquidity Measures Explaining the Probability of being a Dividend Payer, 1989-2011. This table reports the logit regression results using Fama and MacBeth (1973) style estimation, with Newey-West *t*-statistics reported in parentheses over the period 1989-2011 for the nine financial markets. The regressions are based on the firm-year observations available in our sample that are reported in Table 1. The coefficient estimates from the logit regression with Fama and French (2001) firm characteristic variables are reported in Panel A (Model (1)), and coefficient estimates from the logit regressions with Fama and French (2001) firm characteristic variables and different proxies of liquidity are organized in Panel B (Models (2)-(5)). The dependent variable is equal to one if the firm pays dividends that year and zero otherwise. The explanatory variables are market-to-book ratio (*M/B*), asset growth (*dA/A*), earnings-to-asset ratio (*E/A*), size percentile (*Size*), and liquidity measures including turnover ratio (*ToR*), illiquidity ratio (*ILLIQ*), relative bid-ask spread (*PS*) and standardized turnover adjusted number of zero trading days (*LM*). Liquidity measures of *ToR*, *ILLIQ*, *PS* and *LM* are included one at a time in Models (2)–(5) respectively. For brevity, in Models (2)-(5) we report only the coefficient estimates for the liquidity measures. *** indicates significance at 1%, ** indicates significance at 5%, * indicates significance at 10%.

		Predicted sign	Canada	US	Hong Kong	Singapore	Australia	France	Germany	UK	Other European
	Panel A: Firm characteristics as independent variables										
(1)	*M/B*	-	-0.476***	-0.435***	-0.210**	-0.001	-0.197***	-0.062*	-0.022*	-0.026***	-0.002
			(-3.44)	(-15.49)	(-2.49)	(-0.01)	(-3.80)	(-2.03)	(-1.89)	(-5.23)	(-0.25)
	dA/A	-	-0.460***	-1.209***	-0.204	-0.882***	-0.524***	0.760	0.422	-0.271***	0.279
			(-4.62)	(-13.44)	(-0.53)	(-3.20)	(-3.65)	(1.65)	(1.37)	(-5.70)	(1.10)
	E/A	+	2.363***	3.755***	9.555***	5.881***	7.203**	1.245**	4.034***	6.602***	0.371*
			(7.34)	(11.57)	(3.05)	(3.20)	(2.60)	(2.46)	(3.09)	(3.51)	(2.00)
	Size	+	8.375**	4.314***	3.917***	4.293***	6.270***	3.498***	3.185***	5.342***	2.476***
			(2.36)	(25.52)	(14.61)	(21.31)	(13.77)	(3.48)	(7.11)	(25.05)	(11.10)
	Panel B: Firm Characteristics and liquidity measure as independent variables										
(2)	*ToR*	-	-1.010***	-0.216***	-0.079***	-0.303***	-0.209***	-0.327***	-0.516***	-0.150***	-0.099***
			(-2.93)	(-7.14)	(-3.79)	(-3.16)	(-3.96)	(-8.23)	(-5.07)	(-7.91)	(-5.48)
(3)	*ILLIQ*	+	0.026	0.230***	-0.449	-1.032	-0.020	-0.022	-0.039	-0.063	-0.009
			(0.47)	(5.11)	(-0.42)	(-0.51)	(-0.06)	(-1.31)	(-1.10)	(-0.88)	(-0.53)
(4)	*PS*	+	-0.156	0.139***	0.624	0.524	0.093	0.009	0.003	0.317	-0.066
			(-1.26)	(5.12)	(0.80)	(0.26)	(0.40)	(0.55)	(0.10)	(1.31)	(-1.09)
(5)	*LM*	+	-0.519	0.015***	-0.250	0.591	0.202***	0.012***	-0.030	0.016***	0.011***
			(-1.51)	(25.07)	(-1.72)	(1.33)	(2.81)	(4.49)	(-0.53)	(3.02)	(6.04)

The results of Model (1) in Panel A show that slope coefficients associated with the firm characteristic variables largely depict the correct sign (except the insignificant slope on asset growth for France, Germany and Other European) and are mostly significant. That is, consistent with previous evidence, the probability of a firm paying dividends increases with the decrease in market-to-book value and asset growth, and the increase in earnings-to-assets ratio and size percentile. This confirms Fama and French's (2001) hypothesis that larger, more profitable firms with less investment opportunity are more likely to pay dividends.

The specification in Model (2) in Panel B reports the slope estimates for turnover ratio (*ToR*) as the liquidity measure, considered along with the firm characteristic explanatory variables. The results show that the *ToR* coefficient is negative and highly significant (at one percent level) for the case of all countries represented in our sample. Hence we see that turnover ratio, as a proxy for liquidity, can significantly predict a firm's propensity to pay dividends. In Models (3) and (4) we see that the coefficients on Amihud's (2002) illiquidity ratio and the relative bid-ask spread are insignificant for all markets, except for the case of US.[9] For the case of Liu's (2006) liquidity measure *LM*, we find that the slope on *LM* is strongly significant (at one percent level) for five (out of nine) markets and hence its explanatory power is weaker than the turnover measure. The results indicate that only the trading quantity dimension of liquidity captured by both turnover ratio and *LM* explains firms' dividend payout policy in most countries. The coefficients on turnover ratio and *LM* have opposite signs since *LM* is an illiquidity measure. The price impact dimension of liquidity captured by Amihud's (2002) illiquidity ratio and the trading cost dimension of liquidity captured by relative bid-ask spreads cannot strongly predict the probability of a firm being a dividend payer in most countries (except for the US). In the case of US, we find that all four proxies of liquidity are strongly statistically significant at the one percent level. This result corroborates the evidence observed in the US market (among AMEX and NYSE firms) by Banerjee et al. (2007), that liquidity can explain the likelihood of a firm paying

[9] The results remain similar when we use the bid-ask spread (the difference between bid and ask prices) instead of the relative bid-ask spread,.

dividends. Since the turnover ratio measure of liquidity is significantly related to the likelihood of firm paying dividends for all countries considered in the sample, we use the *ToR* measure to further examine the determinants of dividend policy.

Table 2.4 reports the estimates of the logit regression in Equation (1), which predicts the probability of a firm being a dividend payer. We consider six model specifications where we include, along with the Fama and French (2001) firm characteristic variables, additional explanatory variables – debt-to-equity ratio as a proxy for leverage, ratio of retained earnings to book value of equity as a proxy for life-cycle, turnover ratio as a measure of liquidity, and systematic and idiosyncratic risks. For conciseness, in Table 4 we report the slope estimates for all explanatory variables, except the firm characteristic variables.

Table 2.4: Logit Estimation Explaining the Probability of being a Dividend Payer, 1989-2011. This table reports the logit regression results using Fama and MacBeth (1973) style estimation, with Newey-West *t*-statistics reported in parentheses. The regressions are based on the firm-year observations available in our sample that are reported in Table 1. The dependent variable is equal to one if the firm pays dividends that year and zero otherwise. The explanatory variables include the Fama and French (2001) firm characteristic variables (market-to-book ratio (*M/B*), asset growth (*dA/A*), earnings-to-asset ratio (*E/A*) and size percentile (*Size*)) and additional explanatory variables debt-to-equity ratio (*D/E*) as a proxy for leverage, ratio of retained earnings to book value of equity ratio (*RE/BE*), liquidity measure proxied by turnover ratio (*ToR*), systematic risk (*SYS*), and idiosyncratic risk (*IDIO*). Models (1)-(6) estimate the various logit regressions with Fama and French (2001) firm characteristic variables and other explanatory variables. For brevity, we report only the coefficient estimates for all explanatory variables except the firm characteristic variables. *** indicates significance at 1%, ** indicates significance at 5%, * indicates significance at 10%.

		Canada	**US**	**Hong Kong**	**Singapore**	**Australia**	**France**	**Germany**	**UK**	**Other European**
(1)	***D/E***	0.176***	-0.002**	0.001	-0.687**	0.136	-0.086**	-0.126**	-0.002	-0.124***
		(2.85)	(-2.30)	(0.00)	(-2.08)	(1.72)	(-2.13)	(-2.70)	(-0.28)	(-3.57)
(2)	***RE/BE***	0.007**	0.008**	0.008	0.005***	0.004**	0.007**	0.007**	0.000***	0.006***
		(2.43)	(2.14)	(1.23)	(3.35)	(2.38)	(2.34)	(2.66)	(3.65)	(3.83)
(3)	***D/E***	0.304***	0.002	0.006	-0.323	0.502**	-0.079	-0.522	0.158	-0.166*
		(4.04)	(1.44)	(0.08)	(-1.00)	(2.31)	(-1.36)	(-1.30)	(1.35)	(-1.88)
	RE/BE	0.010**	0.013**	0.005***	0.013***	0.013***	0.006**	0.007***	0.000*	0.013**
		(2.83)	(2.26)	(3.95)	(3.22)	(5.56)	(2.36)	(3.51)	(1.96)	(2.21)
	ToR	-0.086**	-0.217***	-0.057***	-0.092	-0.225***	-0.382***	-0.490***	-0.163***	-0.122***
		(-2.63)	(-7.15)	(-6.17)	(-0.76)	(-2.86)	(-8.47)	(-4.92)	(-8.36)	(-6.87)
(4)	***SYS***	-129.804***	-52.280***	-37.934**	-107.648*	-63.960***	-91.763***	-74.882***	-2.162	-63.440***
		(-3.41)	(-4.48)	(-2.15)	(-1.96)	(-3.30)	(-3.80)	(-3.50)	(-0.15)	(-5.06)
	IDIO	-122.802***	-82.306***	-75.258***	-72.452*	-117.518***	-102.643***	-98.871***	-70.476***	-72.567***
		(-11.50)	(-15.32)	(-7.36)	(-2.06)	(-9.83)	(-9.14)	(-12.14)	(-15.51)	(-12.29)
(5)	***ToR***	-0.036	-0.119***	-0.012	-0.308**	-0.949	-0.200***	-0.101	-0.069***	-0.048***
		(-0.52)	(-4.95)	(-1.58)	(-2.29)	(-1.14)	(-5.45)	(-1.57)	(-5.97)	(-4.28)
	SYS	-146.347***	-24.005***	-58.965***	-45.405	-74.177***	-39.920*	-36.007	1.751	-39.003***
		(-3.10)	(-3.09)	(-4.35)	(-0.68)	(-2.93)	(-1.91)	(-1.18)	(0.10)	(-3.73)
	IDIO	-142.347***	-75.962***	-76.491***	-122.146**	-144.919***	-117.377***	-143.705***	-63.246***	-92.248***
		(-11.02)	(-13.24)	(-8.30)	(-2.22)	(-6.67)	(-9.15)	(-4.41)	(-12.12)	(-8.08)
(6)	***D/E***	0.287***	0.002	0.021	0.550	0.245	-0.086	-0.030	0.048***	-0.098**
		(3.78)	(1.16)	(0.33)	(0.57)	(0.83)	(-1.37)	(-0.53)	(3.07)	(-2.22)
	RE/BE	0.009**	0.012**	0.005***	0.016**	0.145**	0.005*	0.007**	0.000**	0.007***
		(2.77)	(2.60)	(4.01)	(2.16)	(2.35)	(1.84)	(2.63)	(2.73)	(3.71)
	ToR	-0.025	-0.120***	-0.011	0.190	-0.1110	-0.240***	-0.033	-0.075***	-0.071***
		(-0.37)	(-4.97)	(-1.24)	(0.38)	(-0.77)	(-4.14)	(-0.72)	(-6.19)	(-5.39)
	SYS	-141.590**	-23.519***	-42.062**	-13.743	-69.574***	-38.679*	-43.075	11.716	-9.181
		(-2.79)	(-3.05)	(-2.30)	(-0.59)	(-2.89)	(-1.74)	(-1.31)	(0.63)	(-0.87)
	IDIO	-140.712***	-76.064***	-74.622***	-100.492**	-120.163***	-128.177***	-154.392***	-66.129***	-99.001***
		(-9.93)	(-13.27)	(-7.76)	(-2.78)	(-3.59)	(-8.74)	(-4.29)	(-10.96)	(-10.02)

Models (1) and (2) report the results when leverage ratio and earned-to-contributed equity mix variables are respectively added to the baseline model with the Fama and French (2001) firm characteristic variables. The results in Model (1) show significant slope on leverage at the one and five percent levels for firms in two-thirds of the countries in the sample, including Canada, US, Singapore, France, Germany and Other European. Consistent with Neves et al. (2006), the results indicate that a firm's leverage has an impact on its dividend payout policy. However, when we consider the overall model with all the key explanatory variables (Model (6)), we find that the slope on leverage is insignificant for most markets. In Model (2), we see that the earned-to-contributed equity mix variable is positive and significantly predicts dividend policy in all countries in the sample, except for Hong Kong. This shows that the life-cycle effect advanced by DeAngelo et al. (2006) features systematically in the sample of countries considered. Our result corroborates the evidence found by DeAngelo et al. (2006) and Denis and Osobov (2008) whereby firms with high earned/contributed equity tend to have the smallest reductions in the probability of being a dividend payer. In Model (3) we include leverage ratio, earned-to-contributed equity mix and turnover ratio, along with the firm characteristic variables. We see that the earned-to-contributed equity mix variable is now statistically significant for all countries, and turnover ratio as a liquidity measure is still significant (as in Table 2) for all the countries except for Singapore. This shows that life-cycle theory and liquidity are important determinants of a firm's dividend payout practice, consistent with the findings of DeAngelo et al. (2006) and Banerjee et al. (2007).

In Models (4), (5) and (6) we investigate whether risk variables, when considered along with the other important explanatory variables, can explain a firm's dividend policy. When incorporating risk variables into the baseline regression in Model (4), we find that both systematic risk and idiosyncratic risk have strong explanatory power for firms in most countries. The significantly negative coefficients for the risk variables are in line with Hoberg and Prabhala's (2009) findings in the US, whereby firm-specific and market-driven risks have a negative impact on the probability of a firm being a dividend payer. These findings suggest that, as in the case of the US, both market-driven and firm-specific risks inversely affect the probability of firms paying dividends and the evidence is found across most markets considered.

In Model (5) we include both risk and liquidity measures along with the Fama and French (2001) firm characteristic variables and find that the systematic and idiosyncratic risk variables still hold significant explanatory power for most countries. The liquidity variable is significant for the case of five out of nine markets, namely US, Singapore, France, UK and Other European. When we consider the model specification with all explanatory variables (in Model 6), we find overall strong significance in most countries for the case of firm-specific and systematic risk variables, followed by the earned-to-contributed equity mix variable. However, the magnitude of the coefficients associated to the earned-to-contributed equity mix variable is small. The turnover ratio variable as a proxy for liquidity shows significance for the case of US, France, UK and Other European markets. The results indicate that the firm-specific and market-driven risk variables are the key drivers of firms paying dividends. For firms in US, France, UK and Other European markets, liquidity is additionally an important determinant of dividend policy.

Based on the estimation results in Model (6), we compute average marginal logit effects to investigate the economic significance of the main explanatory variables. For the case of all markets, we consistently find that risk (mainly the idiosyncratic part) is economically more important than liquidity. We find that a one standard deviation shift in the idiosyncratic risk will significantly reduce the firms' probability of paying dividends by 33% in Canada, 14% in US, 31% in Hong Kong, 28% in Singapore, 32% in Australia, 17% in France, 24% in Germany, 15% in UK and 28% in Other European markets. For the case of US, France, UK and Other European markets, we see that a one standard deviation shift in liquidity will decrease the probability of firms paying dividends by 4%, 11%, 6% and 7% respectively.

2.4 Propensity to Pay and Catering Theory

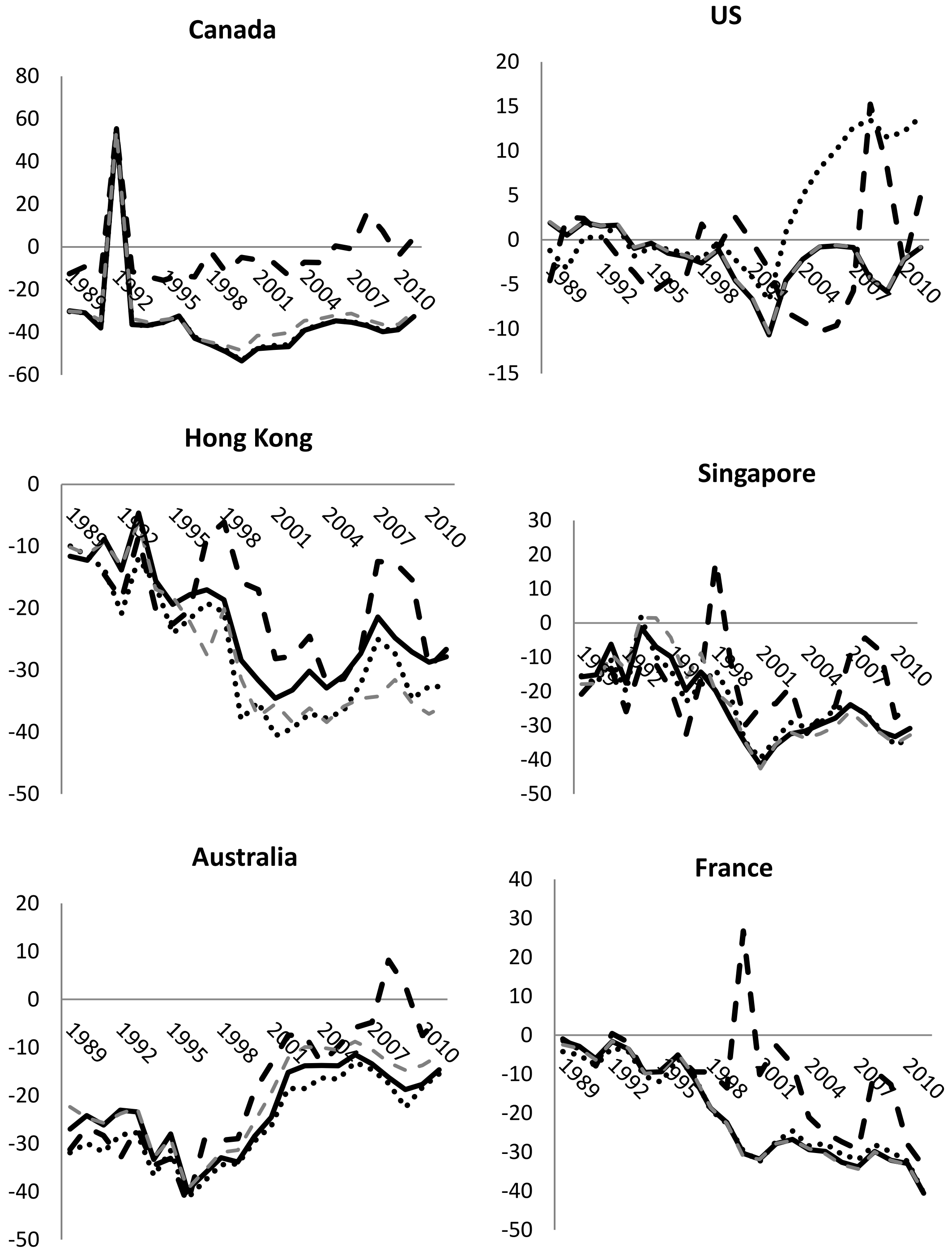
2.4.1 Propensity to Pay

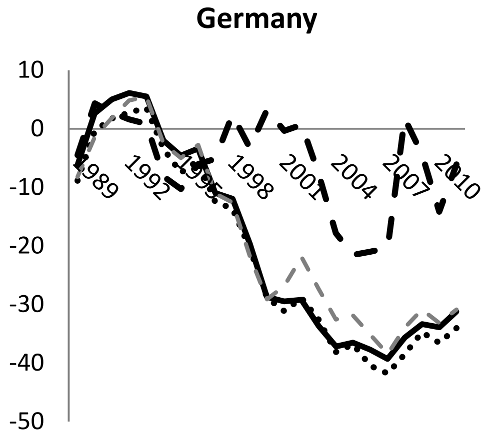
To examine the unexplained proportion of declining dividend payers, we estimate the propensity to pay (*PTP_t*), which is measured as the actual percentage of dividend payers minus the expected percentage of dividend payers in year *t*. The expected percentage of dividend payers is computed using logit regressions with the basic firm characteristic proxies as the independent variables during the base period 1989-2000[10]. To compare the propensity to pay after accounting for key variables such as life-cycle, liquidity and risk, we also estimate the expected probability, using the logit regressions embedded with these key variables, along with the basic firm characteristic variables.

Figure 2.2 plots the propensity to pay estimated with and without the key variables (life-cycle, liquidity and risk adjustments) for the sample period from 1989 to 2011. The solid line in the plots reveals a declining trend in the propensity to pay for most countries, when considering the expected proportion of dividend payers using only firm characteristic variables. We observe a noticeable upward trend in the propensity to pay towards the end of the sample period 2008-2011 in most countries (except for France). This shows that firms continue to pay dividends during the global financial crisis. This evidence supports the signaling hypothesis, where firms are reluctant to cut dividend payments, as they provide an indication of the financial health of the firm. Similar evidence of improved dividend payments during the financial crisis is reported by Acharya et al. (2013).

[10] In choosing the base period, we allow for a similar time span over both the base and out-of-sample periods. Considering the out-of-sample period from 2001, we are able to study the (out-of-sample) evidence over a few business cycles and also ensure that the results are not driven by the financial crisis period. The results of this section remain unchanged when we extend the base period up to 2001.

Figure 2.2: Propensity to Pay with and without Risk and Liquidity Adjustments, 1989-2011. The solid line is the unadjusted propensity to pay before accounting for life-cycle, liquidity or risk effects. The propensity to pay is measured as the difference between actual and predicted percentage of dividend payers, the latter is derived from the logit model with explanatory variables of market-to-book ratio, asset growth, earnings-to-assets ratio and size percentile. The dashed grey line is the life-cycle-adjusted propensity to pay, dotted line is the liquidity-adjusted propensity to pay, and the dashed line is the risk-adjusted propensity to pay.





Germany
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1989
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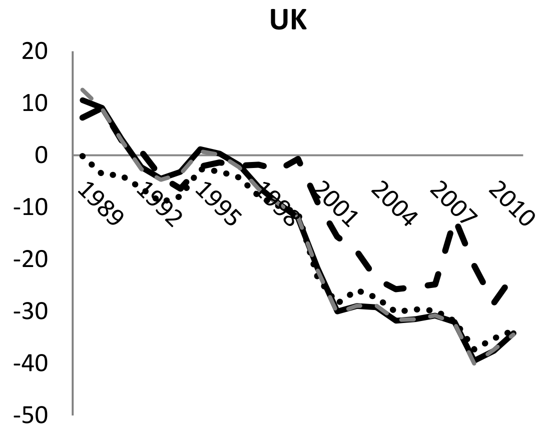
2010



UK
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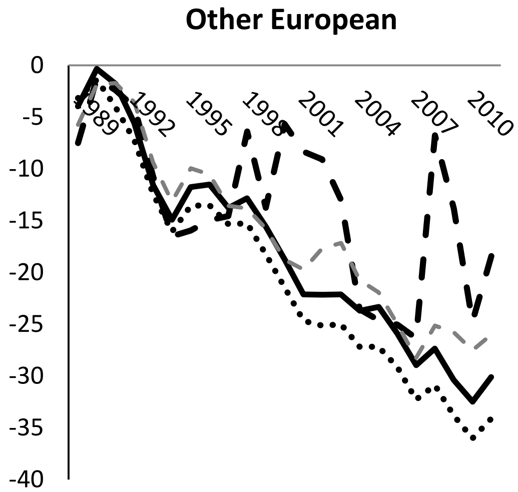


Other European
0
-5
-10
-15
-20
-25
-30
-35
-40
1989
1992
1995
1998
2001
2004
2007
2010

When we account for the effect of firms' life-cycle on the propensity to pay (dashed grey line), we see that in most markets the unadjusted propensity to pay and the life-cycle-adjusted propensity to pay lines are almost overlapping (except for Hong Kong). This shows that life-cycle has little influence on the firms' propensity to pay. When we examine the effect of liquidity on the propensity to pay (dotted line), we find that the liquidity-adjusted and the unadjusted propensity to pay lines are very close to each other and also overlap for most markets (the exceptions being US, Hong Kong and Other European). For US, the distinct spread between the liquidity-adjusted and the unadjusted propensity to pay reveals that firms' liquidity explains a portion of the propensity to pay for US firms. However, when the propensity to pay is adjusted for risk (dashed line), we obtain a consistent picture across all markets. We find that the risk-adjusted propensity to pay is less negative and closer to the x-axis. The evidence suggests that risk is increasingly an important factor in explaining the declining proportion of dividend payers across the world. This conclusion is in line with Hoberg and Prabhala's (2009) findings for the US market. Furthermore, we notice that in all markets, the propensity to pay remains negative in most periods even after accounting for the key variable such as risk.

Next, in order to quantitatively measure the extent to which propensity to pay is explained by life-cycle, liquidity and risk variables, we calculate the average propensity to pay for three out-of-sample time periods: 2001-2011 (whole out-of-sample period), 2001-2006 (pre-crisis period) and 2007-2011 (crisis period). In calculating this measure, we first estimate the propensity to pay from logit regressions based on firm characteristic variables and other key variables of interest (life-cycle, liquidity, and risk) from the 1989-2000 base period. The difference in the average (out-of-sample) propensity to pay with and without the key variables provides an indication of the impact of those variables on the propensity to pay.

Table 2.5: The Average Propensity to Pay Explained by Key Variables (Life-cycle, Liquidity and/or Risk). This table reports the average propensity to pay based on the Fama and French (2001) firm characteristic variables (in Row (1)) and the average propensity to pay based on propensities adjusted for life-cycle effect (in Row (2)), liquidity measure proxied by turnover ratio (in Row (3)), risk (in Row (4)), and all key variables including life-cycle, liquidity and risk (in Row (5)). The average propensities are based on the fitted logit regressions from the 1989-2000 base period. The average propensity to pay over the period 2001-2011are reported in Panel A, the average propensities over the 2001-2006 sub-period are reported in Panel B, and the average propensities over the sub-period 2007-2011 are reported in Panel C.

Explanatory Variables	Countries								
	Canada	US	Hong Kong	Singapore	Australia	France	Germany	UK	Other European
				Panel A: 2001-2011					
M/B, dA/A , E/A, Size	-39.642	-3.606	-28.990	-31.379	-15.744	-31.600	-34.306	-31.552	-26.238
M/B, dA/A , E/A, Size, Life-cycle	-35.621	-3.525	-35.705	-32.959	-12.217	-31.816	-31.195	-31.664	-23.176
M/B, dA/A , E/A, Size, Liquidity	-39.203	6.978	-34.173	-30.762	-17.974	-30.390	-35.797	-30.255	-29.599
M/B, dA/A , E/A, Size, Risk	-1.677	-1.929	-24.317	-20.460	-5.683	-18.802	-10.080	-20.681	-17.615
M/B, dA/A , E/A, Size, Life-cycle, Liquidity, Risk	20.276	2.741	-16.076	-19.180	-5.423	-19.258	-15.856	-26.318	-24.443
				Panel B: 2001-2006					
M/B, dA/A , E/A, Size	-42.053	-4.260	-31.508	-33.155	-15.411	-29.726	-33.980	-28.831	-23.218
M/B, dA/A , E/A, Size, Life-cycle	-37.253	-4.180	-36.491	-34.418	-11.797	-29.948	-29.293	-28.895	-20.371
M/B, dA/A , E/A, Size, Liquidity	-41.606	2.183	-37.269	-31.205	-18.221	-28.534	-34.680	-27.478	-26.398
M/B, dA/A , E/A, Size, Risk	-6.853	-6.810	-28.453	-25.213	-9.536	-15.633	-11.283	-19.642	-17.273
M/B, dA/A , E/A, Size, Life-cycle, Liquidity,Risk	20.312	-2.476	-20.812	-22.803	-9.138	-15.646	-15.620	-25.231	-22.340
				Panel C: 2007-2011					
M/B, dA/A , E/A, Size	-36.748	-2.820	-25.968	-29.249	-16.143	-33.849	-34.696	-34.816	-29.862
M/B, dA/A , E/A, Size,Life-cycle	-33.664	-2.740	-34.762	-31.209	-12.719	-34.057	-33.478	-34.987	-26.542
M/B, dA/A , E/A, Size,Liquidity	-36.320	12.120	-30.457	-30.231	-17.678	-32.617	-37.138	-33.588	-33.439
M/B, dA/A , E/A, Size,Risk	4.535	3.928	-19.353	-14.757	-1.059	-22.605	-8.636	-21.928	-18.027
M/B, dA/A , E/A, Size, Life-cycle, Liquidity, Risk	20.234	7.457	-10.393	-14.832	-0.966	-23.593	-16.138	-27.622	-26.966

Table 2.5 reports the average (out-of-sample) propensity to pay based on the Fama and French (2001) firm characteristic variables (in Row (1)) and the average propensity to pay based on propensities adjusted for life-cycle effect (in Row (2)), liquidity measure proxied by turnover ratio (in Row (3)), risk (in Row (4)), and all three key variables, namely life-cycle, liquidity and risk (in Row (5)). From the results in Panel A, it is apparent that in most markets the impact on the average propensity is largest when adjusted for risk. When we consider the impact of life-cycle (in Row (2)) and liquidity (in Row (3)), we find that the average propensities adjusted for life-cycle effect and liquidity are closer to the average propensities adjusted for firm characteristic variables alone (in Row (1)). Moreover, the absolute value of the average propensities adjusted for all three variables combined (in Row (5)) are very close to or even larger than those adjusted for risk alone (in Row (4)) for all markets except Hong Kong. This reflects the evidence from Table 2.4 that for most markets the coefficients associated with turnover ratio are insignificant and the coefficients associated to the life cycle variable are very small. For the case of Canada, US, France, Germany, UK, and Other European markets, we see that the average propensity to pay is explained more by risk alone, rather than all three variables (life-cycle, liquidity and risk) together. In Singapore 39% (a decline from -31.379 to -19.18) and in Australia 66% (a decline from -15.744 to -5.423) of the average propensity to pay is explained by life cycle, liquidity and risk combined, within which 35% (a decline from -31.379 to -20.46) and 64% (a decline from -15.744 to -5.683) of the average propensity to pay is explained by risk alone.

For robustness, we examine whether the propensity to pay results are driven by the financial crisis. Hence we calculate the average out-of-sample propensity to pay for the two sub-periods 2001-2006 and 2007-2011. The results are reported in Panels B and C respectively. Similar to Panel A, for Canada, France, Germany, UK and Other European markets, we find that the average propensities adjusted for risk (in Rows (4)) are the smallest. For Singapore and Australia, the average propensities adjusted for risk are very close to those adjusted for the three key variables combined (in Rows (5)). Overall, the results in Table 5 confirm that risk has the largest explanatory power for the propensity to pay.

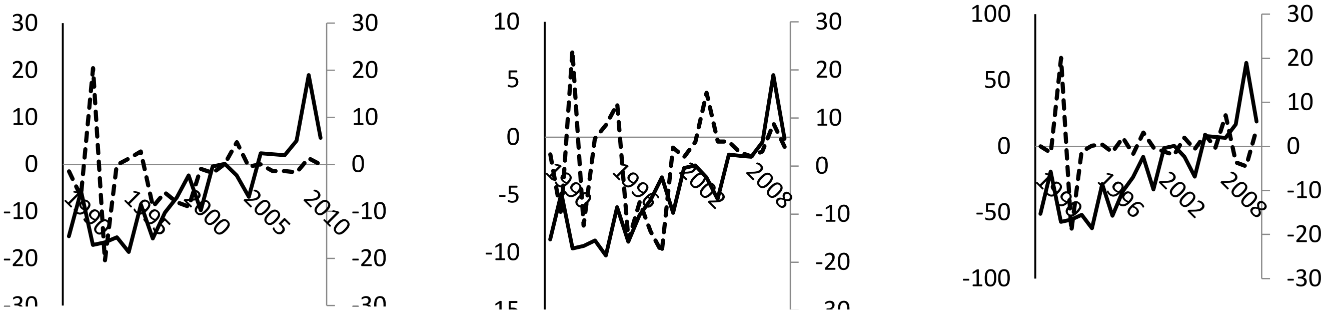
2.4.2 Catering Incentives

In this section, we examine whether catering incentives advocated by Baker and Wurgler (2004a, 2004b) can explain the unexpectedly low percentage of dividend payers observed in the markets. According to the catering hypothesis, market prices of dividend-paying firms and non-dividend-paying firms with similar characteristics are driven by investor sentiment. Investors place a premium or a discount on dividend payers or non-payers according to their preference for dividends. This premium (discount) will draw firms to cater to the prevailing demand by altering their dividend policy. Moreover, the change in dividend payment policy caused by investment sentiment is not captured by firm characteristics. Thus, the change in the unexpected proportion of dividend payers is suggested to be positively related to the premium (discount) at the beginning of the period. Thus, to capture the changes in the propensity to pay, Baker and Wurgler (2004a, 2004b) define dividend premium as a proxy for catering incentives. Dividend premium refers to the difference between the log of the equally- or value-weighted market-to-book ratio for dividend payers and that of non-payers [11]. Baker and Wurgler (2004b) show that dividend premium can substantially explain the declining propensity to pay in the US market.

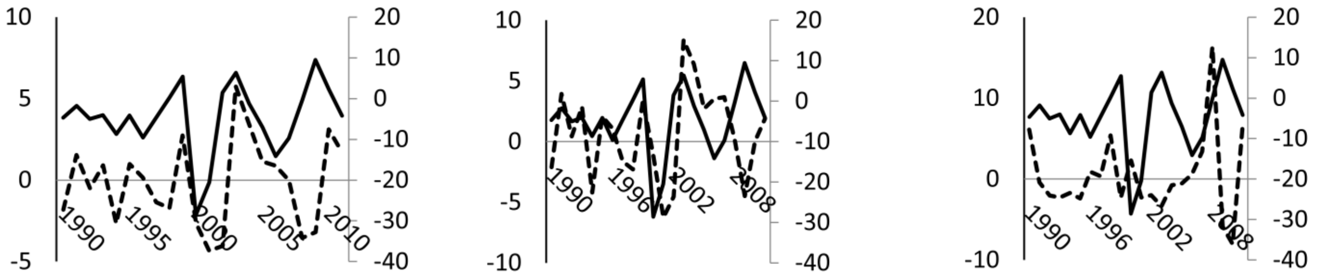
[11] Following Baker and Wurgler (2004b), we use the book-value weighted-average dividend premium for our analysis. The equally-weighted dividend premium is also considered for robustness (but not reported here) leading to similar conclusions.

Figure 2.3: Lagged Dividend Premium and Changes in Propensity to Pay Dividends with and without Risk and Liquidity Adjustments, 1989-2011. The figures illustrate the relationship between book-value-weighted dividend premium (one lagged, the solid line) and the changes in propensity to pay dividends (the dashed line) when unadjusted for liquidity or risk (in Column 1), when adjusted for liquidity (in Column 2) and when adjusted for risk (in Column 3) for the nine financial markets in our sample.

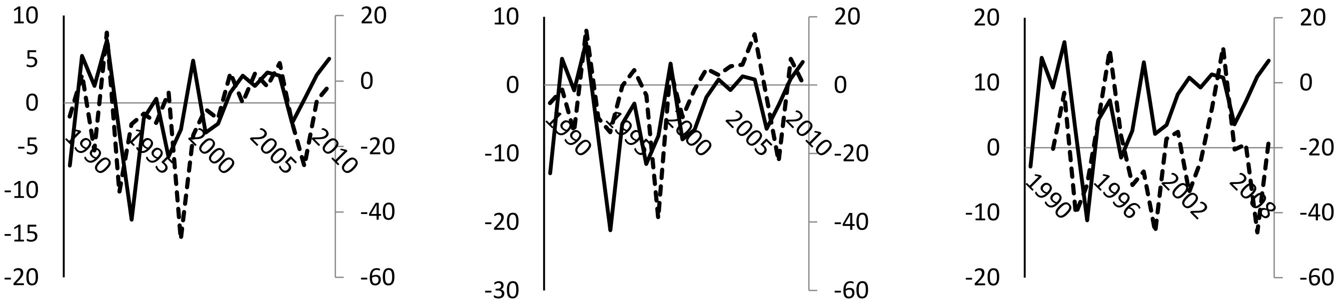
(i) Canada



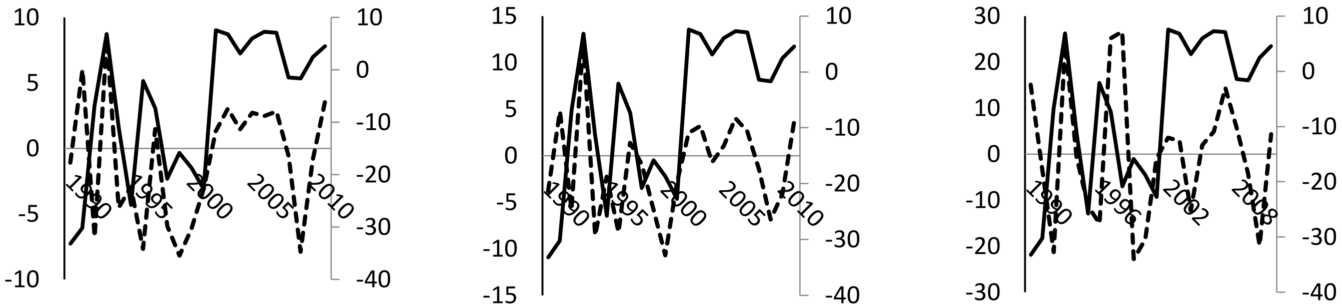
(ii) US



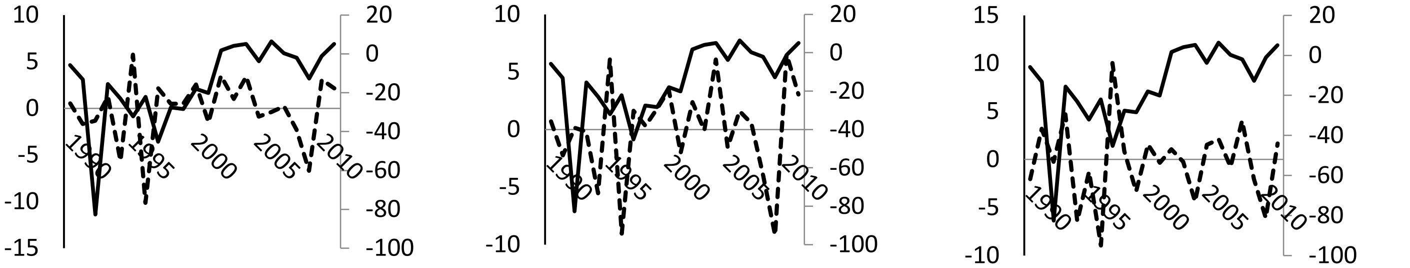
(iii) Hong Kong



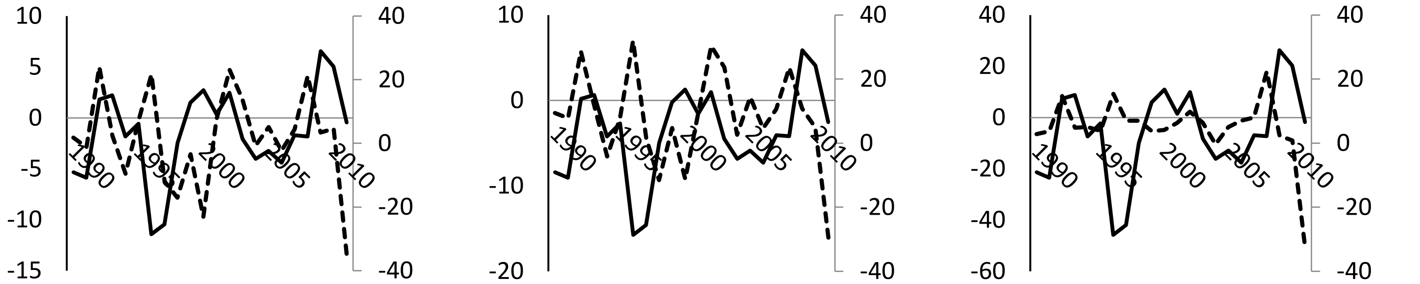
(iv) Singapore



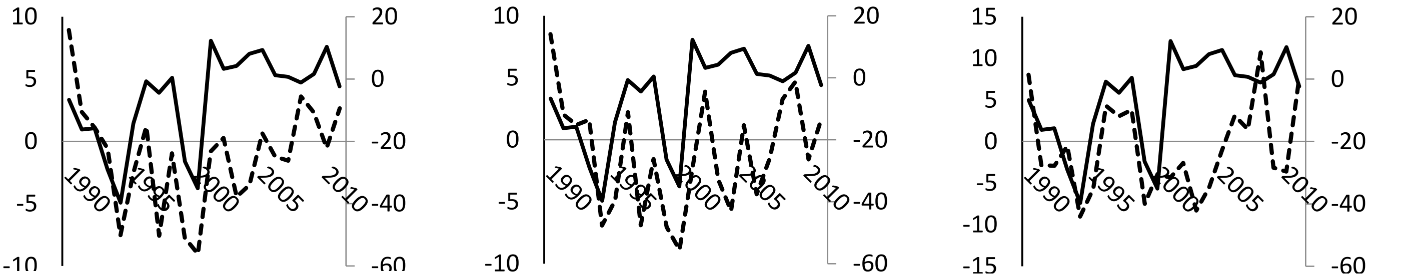
(v) Australia



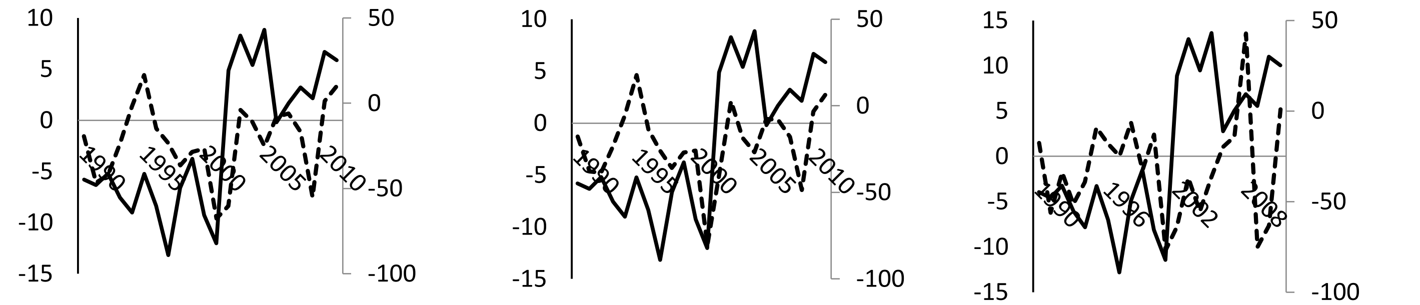
(vi) France



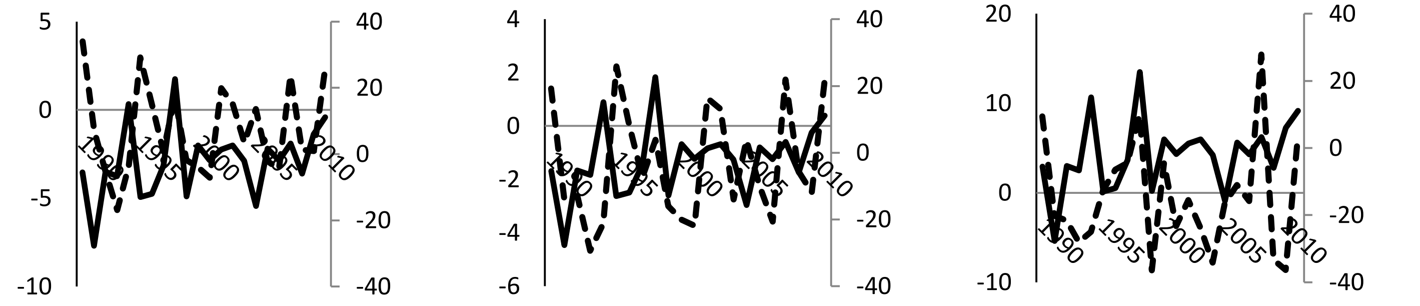
(vii) Germany



(viii) UK



(ix) Other European



In Figure 2.3 we visually depict whether dividend premium (capturing catering incentives) in the preceding year can predict the changes in propensity to pay for a firm in the current year. Column (1) in Figure 2.3 plots the lagged dividend premium and the annual changes in propensity to pay without risk and liquidity controls for the nine markets in our sample. We see that the evolution patterns of the two series (though non-overlapping each other) exhibit some degree of consistency, for most countries. This provides preliminary evidence that dividend premium does influence the dividend decisions made by firms. Overall a similar picture emerges when adjusting the changes in propensity to pay for liquidity (see figures in Column (2)). When we adjust for liquidity, for most countries, the dynamics of changes in propensity to pay (dashed line) remains similar to those seen in Column (1), but scaled upwards or downwards. However, the risk-adjusted changes in propensity to pay in Column (3) present a different picture. Once we adjust for risk, the evolution pattern of the changes in propensity to pay (dashed line) alters, as compared to those in Columns (1) and (2). For all countries in our sample, we see the relationship between lagged dividend premium and the changes in propensity to pay has weakened considerably after adjusting for risk. Hence, a visual conclusion we can draw is that the catering hypothesis is weakened once the changes in propensity to pay are adjusted for the risk element in dividend policy.

Next, we statistically test for the presence of the catering hypothesis by regressing the changes in propensity to pay against the lagged dividend premium. More specifically, the regression is defined as follows:

$$\Delta PTP_t = \alpha + \beta P_{t-1}^{D-ND} + \theta FC_t + \varepsilon_t \qquad (5)$$

where ΔPTP_t represents the changes in propensity to pay and P_{t-1}^{D-ND} is the lagged dividend premium (capturing catering incentives). We include the financial crisis dummy variable (FC), which is equal to one in the years from 2007 to 2011 and zero otherwise. The FC variable captures the potential impact of the financial crisis on the dividend payout decisions of firms[12].

Table 2.6 presents the regression results of Equation (5) for the sample period 2001-2011 and is organized in various panels. We consider two model specifications within each panel - Model (1) without the *FC* variable and Model (2) with the *FC* variable. Panel A reports the estimates of the regressions, where the propensity to pay is based on the fitted logit regression with Fama and French's (2001) firm characteristic variables. The results in Panel A indicate that before adjusting for liquidity and/or risk, catering incentive has a significantly positive impact on the changes in the unpredicted proportion of dividend payers. This result is only significant for the case of common law countries (as opposed to civil law countries) in our sample – Canada, Hong Kong, Singapore, Australia and UK. Our results are in line with the evidence found by Ferris et al. (2009) that countries' legal systems have a significant impact on the level of dividends paid by the firms located in those countries. Our results corroborate with Ferris et al. (2009) in that countries with greater investor protection (common law countries) are more responsive to the changing investor preferences and therefore significant catering occurs in such countries. The evidence for the presence of catering is not found in the US[13] or any of the civil law markets considered in our sample, namely France, Germany and Other European.

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[12] Supporting the signaling hypothesis, Acharya et al. (2013) report a significant positive influence of the global financial crisis on firms' dividend payout practice.

[13] Hoberg and Prabhala (2009) similarly report limited evidence for catering theory in the US when using the out-of-sample test of Fama and French (2001) as in this paper. They find that dividend premium remains mostly insignificant in several model specifications for the changes in propensity to pay. Further, they report that even the trace of significance found is entirely eliminated when controlling for risk.

Table 2.6: Testing for Catering Effect in Changes in Propensity to Pay. This table reports the estimates of the time-series regression during 2001-2011 (Equation 5) with the explanatory variables including lagged dividend premium (Catering) and 2007-11 financial crisis period dummy (FC). The dependent variable is the change in propensity to pay, which is the difference between propensity to pay in the current year and the preceding year. The propensity to pay (PTP) is the difference between actual and predicted percentage of dividend payers, the latter is calculated with mean estimates of annual logit regressions for the base period 1989-2000. The regressions are based on the firm-year observations available in our sample that is reported in Table 1. The results for unadjusted PTP based on annual logit regressions with Fama and French (2001) firm characteristic variables is reported in Panel A and Panels B-E report the results based on logit regressions with additional variables life-cycle, liquidity, risk and all of the above (life-cycle, liquidity and risk combined) respectively. The numbers in parentheses are the *t*-statistics adjusted for heteroscedasticity and autocorrelation. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

		Group A: markets with catering effect					Group B: markets without catering effect			
		Canada	**Hong Kong**	**Singapore**	**Australia**	**UK**	**US**	**France**	**Germany**	**Other European**
Panel A: Unadjusted PTP										
(1)	**Catering**	0.005	0.224***	0.232**	0.236*	0.072***	0.087	0.043	-0.219	0.009
		(0.09)	(3.37)	(2.64)	(1.96)	(3.89)	(0.65)	(0.74)	(-1.80)	(0.22)
(2)	**Catering**	0.203***	0.263**	0.238***	0.230*	0.068***	0.114	0.127	-0.099	0.004
		(3.79)	(3.05)	(3.49)	(2.19)	(3.80)	(0.78)	(0.92)	(-0.88)	(0.11)
	FC	-4.209*	-2.423	-2.137	-1.332	2.092	-1.475	-3.897	2.360	0.496
		(-2.29)	(-1.21)	(-1.14)	(-0.88)	(0.86)	(-0.62)	(-0.85)	(1.80)	(0.38)
Panel B: PTP adjusted for Life-cycle										
(1)	**Catering**	-0.017	0.19**	0.240**	0.031	0.088***				
		(-0.23)	(2.27)	(2.96)	(0.21)	(4.52)				
(2)	**Catering**	0.032	0.220*	0.025***	0.021	0.083***				
		(0.40)	(2.03)	(3.97)	(0.18)	(4.72)				
	FC	-1.030	-1.861	-1.815	-2.574	2.269				
		(-0.78)	(-0.81)	(-1.32)	(-1.53)	(0.98)				
Panel C: PTP adjusted for Liquidity										
(1)	**Catering**	0.003	0.355**	0.227*	0.342*	0.089***				
		(0.07)	(3.04)	(2.19)	(2.03)	(4.14)				
(2)	**Catering**	0.188***	0.391**	0.235**	0.337*	0.086***				
		(3.68)	(2.83)	(3.17)	(2.19)	(4.24)				
	FC	-3.925**	-2.281	-2.649	-1.354	1.623				
		(-2.39)	(-0.74)	(-1.40)	(-0.56)	(0.82)				
Panel D: PTP adjusted for Risk										
(1)	**Catering**	-0.410	0.291	0.194	0.030	0.049				
		(-1.01)	(0.89)	(1.09)	(0.46)	(1.28)				
(2)	**Catering**	-0.748	0.026	0.194	0.028	0.039				
		(-1.26)	(0.86)	(1.06)	(0.42)	(1.26)				
	FC	7.155	1.872	-0.068	-0.567	4.981				
		(0.65)	(0.37)	(-0.01)	(-0.28)	(1.04)				
Panel E: PTP adjusted for Life-cycle,Liquidity and Risk										
(1)	**Catering**	-0.317	0.354	0.176	0.015	0.050				
		(-1.15)	(1.46)	(1.76)	(0.33)	(1.52)				
(2)	**Catering**	-0.564	0.345	0.179	0.014	0.045				
		(-1.30)	(1.52)	(1.58)	(0.31)	(1.30)				
	FC	5.230	0.578	-0.777	-0.222	1.788				
		(0.69)	(0.14)	(-0.15)	(-0.16)	(0.67)				

To explore the dividend catering hypothesis among common law countries further, we examine the relationship between changes in propensity to pay and lagged dividend premium, after adjusting the propensity to pay for effects of life-cycle, liquidity and risk. Panels B-E present the regression results where the propensity to pay is adjusted for life-cycle theory, liquidity, risk, and all the above (life-cycle, liquidity and risk combined) respectively. From the results in Panel B we find that after accounting for the presence of the life-cycle influence on the propensity to pay, we see the catering variable is still significant for three of the five markets (Hong Kong, Singapore and UK). This is in line with evidence found by Ferris et al. (2009) that catering incentives persist even after accounting for the effect of a firm's life-cycle. For the case of Canada and Australia, we find that life-cycle theory explains the catering phenomenon observed in those markets. Further, after accounting for liquidity effects in Panel C, the coefficient on catering incentives still remains significant in explaining the adjusted propensity to pay. Hence liquidity cannot explain why firms "cater".

However, once the propensity to pay has been adjusted for risk, the results in Panel D show that catering incentives no longer explain the changes in propensity to pay, for the case of all common law countries considered in our sample. Hence we do not find evidence of a catering effect once we control for risk. Our results indicate that the role of catering reflects the risk-reward relationship in the changing propensity to pay dividends. Our evidence corroborates Hoberg and Prabhala's (2009) findings in the US market and reveals that a risk-based explanation of the catering phenomenon is prevalent across all countries. In Panel E, we test the significance of catering incentives after controlling for the combined effects of life-cycle theory, liquidity and risk, thereby confirming the conclusion drawn from the previous panel. Overall, the results show that risk is significant in explaining the changes in propensity of dividend payments. Moreover, once we adjust the propensity to pay for risk, we see that dividend premium loses its explanatory power and hence we find no support for the presence of catering incentives among firms across countries.

2.5 Conclusion

This paper examines the empirical determinants of dividend payout policy among firms operating in eighteen different countries, amalgamated into nine major financial markets – Canada, US, Hong Kong, Singapore, Australia, France, Germany, UK and Other European. Using an extended sample period from 1989 to 2011, we test to what extent key variables such as life-cycle, liquidity and risk can explain a firm's probability of paying dividends. We find that risk plays a key role in explaining a firm's dividend policy across all markets. For the case of firms in the US, France, UK and Other European markets, liquidity is additionally an important determinant of dividend policy, along with risk. Across the nine markets considered in our sample, the average marginal effects show that risk explains 14% to 33% and liquidity explains 4% to 11% of the firms' probability of paying dividends. Further, we also find significance for the life-cycle variable (earned-to-contributed equity mix) advanced by DeAngelo et al. (2006), but the explanatory power for the life-cycle effect is small as compared to risk. The firm-specific and market-driven risk variables remain strongly significant in explaining dividend payout policy, even after accounting for the effects of the firms' life-cycle and liquidity.

Further, we study the changes in the propensity to pay and test whether catering theory can explain the disappearing dividends puzzle observed in financial markets. We find that catering incentives have a significantly positive impact on the changes in the unpredicted proportion of dividend payers for firms operating in common law countries (Canada, Hong Kong, Singapore, Australia and UK in our sample). The result is insignificant for the case of firms operating in the US and in civil law markets (France, Germany and Other European in our sample). Our results corroborate with Ferris et al. (2009) in that countries with greater investor protection (common law countries) are more responsive to changing investor preferences and therefore significant catering occurs in such countries. When considering effects of liquidity, we find that liquidity fails to replace catering incentives in explaining the changes in propensity to pay across markets. For Canada and Australia, we find that life-cycle theory provides an explanation for the catering phenomenon observed in those markets. However, when the propensity to pay is adjusted for risk, we obtain a consistent picture across all markets. Once we adjust for risk, we see that dividend premium (capturing the catering incentives) can no longer explain changes in propensity to pay, even among the common law countries. Our results indicate that the role of catering reflects the risk-reward relationship in the changing propensity to pay dividends. Our evidence corroborates Hoberg and Prabhala's (2009) findings in the US market and reveals that the risk-based explanation of the catering phenomenon persists across several financial markets.

Chapter 3 Investor Incentives: Corporate Governance and Dividend Policy

We study the impact of investors, managers and board on both of the cash and stock dividend policy in China. First, our results suggest that lifecycle, risk and liquidity are important determinates of firms' cash/stock dividend policy. Second, we find that managerial stake could not significantly impact firms' cash/stock dividend payout policies. Third, the results show that firms with larger board size and less annual board meetings are more likely to pay cash dividends, and less likely to pay stock dividends. Finally, we find little support for the catering theory in China with regards to both cash and stock dividend payouts. Absent liquidity or risk controls, catering incentive matters, but it is insignificant once we control for liquidity or risk. Our result indicate that board, rather than managers or investors influences firms' cash/stock dividend payout policies in China.

Chapter 3 Investor Incentives: Corporate Governance and Dividend policy

3.1 Introduction

Ever since Fama and French (2001) establish that the percentage of dividend payers dropped dramatically over the period 1978-1999, the “disappearing dividends” puzzle has been studied widely. Investigating firm-level data of UK companies, Benito and Young (2003) find that the portion of firms which do not pay dividends increased from 14.3% to 25.2% during the period 1974-1995. Examining dividend payments between 1989-2002 in Canada, France, Germany, Japan, the United Kingdom, and the United States, Denis and Osobov (2008) note that, although the magnitude of the decline in the propensity to pay dividends differs in the six countries, the fraction of dividend payers in all countries falls during this period. Similarly, Kuo et al. (2013) find evidence for the disappearing dividend phenomenon in both common law and civil law countries.

Attempts to explain the disappearing dividend puzzle draw on a number of theories. Baker and Wurgler (2004b) advance a catering theory to explain the phenomenon. According to catering theory, managers cater to prevailing investors’ demand for dividends by paying dividends when investors are putting a premium on dividend payers, and not paying when the dividend premium is negative. Baker and Wurgler (2004a) find that dividend premium could explain the actual magnitude of the post-1977 disappearance in the percentage of dividend payers documented by Fama and French (2001) in the U.S. The catering theory is also empirically supported by Ferris et al. (2006) with U.K. evidence, Denis and Osobov (2008) with worldwide evidence and Kuo et al. (2013) with evidence in common law countries. However, some studies find no evidence for the presence of catering theory such as Julio and Ikenberry (2004). Julio and Ikenberry (2004) claim that catering incentive is poor in explaining the declining percentage of dividends payers after controlling age and size for U.S firms. Similar evidence is reported by Savovy and Weber (2006) with international data.

In addition, liquidity and risk factors have also been proposed as possible explanations of the puzzle. Banerjee et al. (2007) study dividend payments among U.S. firms. They use several liquidity proxies and find that liquidity matters in explaining dividend payments after controlling for firm characteristics. Kuo et al. (2013) also find that liquidity is an important determinant of dividend payout policy. However, their research finds evidence that catering incentives still matter, even after controlling for liquidity. With respect to risk, Hoberg and Prabhala (2009) find that both systematic and idiosyncratic risks significantly impact on the dividends paying status of U.S. firms. Further, they find that after controlling for risk, the explanatory power of the catering incentive disappears. Thus, they suggest that the dividend premium matters in Baker and Wurgler (2004a) not because it reflects investors' preference but rather because it acts as a proxy for risk. This argument is supported by Kuo et al. (2013) with worldwide evidence. They find that the relationship between dividend premium and changes in propensity to pay vanishes, once they control for risk. In contrast, Bulan et al. (2007) find evidence that the catering incentive still helps to explain the idiosyncratic risk adjusted propensity to pay dividend of the U.S. firms.

While the inconsistencies in prior empirical research are likely to be at least partially related to the use of different models and estimation methods, they also point towards the possibility that country specific idiosyncrasies impact on the factors which drive dividend pay-put policies. Unlike the other markets that have been previously used to explore the disappearing dividend puzzle, China is a fast-growing economy with some specific characteristics, such as complicated corporate ownership structures. Such difference may lead to different results from those for the other markets. Investment in listed companies is a comparatively new phenomenon in China. However, since the inception of the Shanghai (SHSE) and the Shenzhen (SZSE) Stock Exchange, the Chinese stock market has experienced a rapid expansion. Between 1991 and August 2014, the number of companies listed on the SHSE increased from 6 to 969, and the number of companies listed on the SZSE from 9 to 1589. During the same period the total market capitalization of the SHSE grew from RMB 2.94 billion to RMB 16.33 trillion, while that of the SZSE increased from RMB 7.98 billion to RMB 10.54 trillion.

Nevertheless, in terms of regulation the Chinese capital market lags far behind that of countries such as the USA or UK. In particular with regard to information disclosure and corporate governance standards are considerably lower (Anderson et al., 2011). Further, the ownership structure of Chinese listed companies is often more complicated than that of companies domiciled in developed financial markets. In line with the objective to develop a socialist market economy, many listed firms had both tradable (A-, B- and H-shares) and non-tradable shares (state-owned and legal-person shares).[14] Between 1994 and 2004, only about 30 per cent of shares of listed companies were tradable (Lin et al., 2010). Moreover, until 2001/02 only domestic investors were permitted to trade in A-shares, whereas only foreign (or Hong Kong) investors were permitted to trade in B- or H-shares (Chen et al., 2013). In this context Ahlgren et al. (2009) note that, although segmentation between domestic and foreign investors itself is not unusual, they found that in China domestic investors' A shares were sold at a premium over foreign B shares, whereas in other countries the reverse tends to be true, and that A- and B-share markets appeared to have independent pricing dynamics. Although the price discount for H- and B-shares has fallen in recent years as both domestic and foreign investors were given increasing access to the different markets, some degree of price differentiation persists (Ahlgren et al., 2009; Arquette et al., 2008; Cai et al., 2011).

Only slowly, due to an increase in the number of private firms listing on stock exchanges and the 2005 stock-split reform, which enabled state-owned shares to be traded, did the proportion of state controlled listed companies in China fall from 73% in 2000 to 21% in 2010 (Conyon and He, 2012).

[14] Legally both tradable and non-tradable shares have the same cash-flow and voting rights.

These specific characteristics of Chinese listed companies and the Chinese stock markets might lead to different financial behaviours and dividend policies than those observed in other countries, which make the setting worthy of exploration.

Moreover, given the degree of state ownership in listed firms in China, it is worthwhile to consider the potential impact of the existence of controlling government blockownership on firms' propensity to pay dividends. If government blockholders effectively contribute to the supervision and control of managers, the presence of controlling government blockholders is likely to improve corporate governance (Chen et al., 2009) and increase the pressure on managers to pay dividends. However, alternatively, there is a risk that, due to a lack of personal economic incentives, government representatives contribute little to corporate governance (Chen et al., 2009), or they might indeed collude with managers to exploit other shareholders in order to pursue government objectives, such as economic growth and employment (Firth et al., 2010). In this case firms might be less likely to pay dividends.

Since the early 1980s, a great number of literature have found that managerial ownership and board characteristics play important role in the decision making process concerning corporate dividend policy (Baker et al. 2003). Recent developments in financial literature suggest that the propensity to pay dividends seem to vary over time and the time varying preferences of investors are the main driver behind this. While previous research considered the impact either of board characteristics (Anderson et al., 2011) or managerial ownership (Nam et al., 2010) or investors' preference (Baker and Wurgler, 2004a) on firms' dividend payout policy, this research considers all three aspects jointly. This paper considers the impact of shareholders, managers and board on the dividend payout decisions. We find that for both stock dividend and cash dividend, managerial stake contributes little toward explaining firms' dividend decision. Our results also show that firms with larger board size and less annual board meetings are more likely to pay cash dividend to mitigate the conflict between firms and investors. And such firms are less likely to pay stock dividend. Further, this paper finds that after controlling for risk/liquidity, catering incentives are insignificantly related with propensity to pay cash/stock dividend policy.

Therefore, board rather than investors or managers impact cash/stock dividend payout policies in China.

This study further makes the second contribution, which is to study the time series cash dividend payout pattern in China, to explore changes in the cash dividend payment pattern. We observe significant decline in the percentage of dividend payers over the period 2002-2006 and recovery after that. Further, we find that catering incentive matters for explaining the unexpected percentage of dividend payouts, if we do not control for risk or liquidity. However, once we control the propensity with risk or liquidity, the significant explanatory power of dividend premium disappear. This indicates that the catering proxy measures the risk/liquidity difference between dividend payers and non-dividend payers. That is, the significance of the dividend premium is because it acts as a proxy for risk, not because it captures investors' demand for dividends.

Finally, the third contribution of this study is that we examine stock dividend payment pattern and the determinants of stock dividend payments. This is the first study, to the best of our knowledge, to investigate stock dividend payment pattern. Also, this is the first paper that adopts stock dividend premiums to test the catering theory for stock dividends. The stock dividend payments has long been one of the least understood phenomena in equity markets (Al-Yahyaee, 2014). Although stock dividend does not change firms' value, many firms still engage in these transactions and even more there is a positive market reaction when these transactions are announced. (McNichols and Dravid, 1990) . Especially in Chinese stock market, research finds that public investors appear to favour stock dividends over cash dividends (Anderson et al., 2011; Cheng et al., 2009; Wei and Xiao, 2009). We find that the percentage of stock-dividend payers in China decreased dramatically from 13.82% in 1999 to 2.36% in 2013. Also, our results show that state-owned firms are less likely to pay stock dividends. This is consistent with the dividend preference theory, which suggest that the state shareholders do not favour stock dividend as they could not benefit from capital gains arising from share price changes in the secondary market. Meanwhile, we find that risk is negatively related with the probability of being a stock dividend payer, while liquidity measured by stock turnover positively correlated with stock dividend payments in China over our sample period. Further, we test the applicability of catering theory to stock dividend payouts in China. We find little support for the hypothesis that changes in stock dividend payment pattern reflects firms' catering to investors' preference for stock dividend payments in China. Absent liquidity or risk controls, proxy for the investors' preference matters in explaining the disappearing stock dividends, but the proxy is insignificant once we control for liquidity or risk. The remainder of this paper is organized as follows. Section 2 presents the literature review. Data selection and methodology are described in Section 3 while Section 4 reports the empirical results. Section 5 provides results for stock dividend payments. Section 6 concludes.

3.2 Literature review

3.2.1 Dividend Payout Patterns

Using a large sample of Compustat and CRSP data from 1926 to 1999, Fama and French (2001) analyse the time trends in dividend policy and recognize that the proportion of firms paying dividends declines from 66.5% in 1978 to only 20.8% in 1999. They initially assumed that the increase in small listed companies with low profitability and great investment opportunities during this period might explain the declined percentage of dividends payers. However, even after controlling for relevant firms' characteristics such as size, profitability and investment opportunities, they still found a reduction in the percentage of dividends payers between 1978 and 1999. This phenomenon of the unexplained decline in dividends payers has been named the "disappearing dividends puzzle" by Fama and French (2001).

Unlike in the United States, the UK provides tax credits to compensate for firms' tax payments. Thus, shareholders in UK are supposed to have a stronger preference for dividends payers. However, the disappearing propensity to pay dividends was also observed in the UK by Benito and Young (2003), who investigated firm-level data of UK companies and documented that the portion of dividends omission firms increased from 14.3% to 25.2% during the period 1974-1995. A similar phenomenon in the UK was also identified by Renneboog and Trojanowski (2005), and Ferris et al. (2006).

Denis and Osobov (2008) examined the dividends payment over 1989-2002 in Canada, France, Germany, Japan, the United Kingdom, and the United States and reported that, although the magnitude of the decline in the propensity to pay differs in the six countries, the proportion of dividends payers falls in all of the countries during this period.

3.2.2 Dividend Payout Policy in China

As previously discussed, China has a unique economic and financial environment, which might affect how investors and corporate governance impact on dividend payment patterns.

Firstly, unlike the U.S. equity market, which is a dealer market and is dominated by institutional investors, the Chinese equity markets follow a purely order-driven trading mechanism that is mainly dominated by individual investors (Nguyen and Wang, 2013). According to the 2013 *China Securities Depository and Clearing Statistical Yearbook*, the total number of stock accounts in China rose from 58 million in 2000 to 175 million in 2013. Nguyen and Wang (2013) report that more than 99% of these accounts are opened by retail investors. In 2002 individual investors were responsible for approximately 99% of the total number of trades and 95% of the total trade value in 542 A-shares listed on the Shanghai Stock Exchange (Ng and Wu, 2006). Given the dominance of retail investors in China, it might be reasonable to assume that firms' managers choose dividend policy that caters to these individual investors. However, most Chinese investors are small, unsophisticated, or noise-trading investors, whose interests are poorly protected (Nguyen and Wang, 2013). This raises the question to which degree managers are actually under pressure from the capital market to cater to investors' interests, and to reduce agency costs, e.g. by engaging in dividend payments to reduce their managerial discretion over the use of free cash flows.

Secondly, government ownership is still comparatively wide spread in listed companies. While the 2005 stock-split reform has enabled government agencies to sell shares more easily, in general state owned shares tend to have limited tradability. State blockholders are therefore expected to have long investment horizons and to be less interested in short-term dividend signals to boost the current prices. Moreover, the rewards for managers in the state-owned firms are often determined by the managers' political connections and their relationship with government officials. Thus managers may act to meet government objectives rather than maximize shareholders' value. In both instances it is likely that managers' dividend decisions are driven mainly by the desire to meet the interests of the government blockholders rather than that of portfolio investors.

However, critics of state ownership point out that, as the state needs representatives to act on its behalf, state ownership might indeed create a control vacuum, as the bureaucrats who are charged with protecting the government's and the public's interests lack the incentives or qualifications to do so (Dong and Li, 2011). In this case managers might pursue a dividend policy which serves their own interests rather than that of portfolio retailers or the government.

Thirdly, stock dividend payment is a significant feature of Chinese firms' dividend policy (Chen and Yuan, 2004). Wei and Xiao (2009) suggest that on average 34.46 per cent of listed Chinese firms pay stock dividends over the period 1993-2006. They argue that the listed companies in China would like to pay stock dividends for two reasons. One the one hand, since stock splits are prohibited by the corporate law in China, stock splits could not be used as a substitute for stock dividend and therefore listed Chinese firms would like to pay stock dividends; On the other hand, listed companies in China could raise more capital by paying stock dividends before a rights issue.[15] Additionally, prior studies document significant increase in stock prices on both the stock dividend ex-date (Yuan, 1999) and the stock dividends announcement date (Wei, 1998). Firms take advantage of this positive announcement reaction when they are cash poor or have lower profitability (Anderson et al., 2011). Research also finds that public investors in China favour stock dividends over cash dividends (Chen and Yuan, 2004; Cheng et al., 2009). Cheng et al. (2009) find that listed Chinese firms with a higher fraction of A-share are more likely to pay stock dividends. Thus they conclude that public investors in China prefer stock dividend, which serves as signal of higher profitability. Chen and Yuan (2004) argue that the rapid expansion of Chinese stock market in terms of market capitalization and number of listed companies implies strong public demand for stock shares. This is mainly because that there have been limited investment opportunities in China for individuals. Until 1998, the real estate market and mutual funds did not exist in China. Also, before the foundation of the Shanghai Gold Exchange in 2002, the transactions on precious metals such as gold and silver are controlled by the governments. Before the inception of the Shanghai (SHSE) and the Shenzhen (SZSE) Stock Exchange in 1990, limited government bonds and bank deposits are individuals' only investment opportunities in China (Wei and Xiao, 2009). In addition, in China, the return on equity is generally high. Zhang (1998) reports that the average premium on initial public offerings is about 90 per cent. Furthermore, as the capital gains from stock investments are tax free, both individuals and institutional investors would like to invest in the stock market.

[15] In China, the board directors normally propose a rights issue at the shareholders' annual general meeting (AGM) to be held around two months after the end of the fiscal year. If the proposal is approved, the firm need to get the final approval from CRSC. The process takes about one month. Then if approved, the company could prepare a rights issue prospectus, in which the rights issue price will be fixed. The price for the rights issue is based on the average stock prices over the 20-day period before the publication of the prospectus. Meanwhile, listed firm proposes a dividend payout plan in its annual report, then the proposal need to be approved at the AGM. This indicates that the rights issue price is determined far after the disclosure of the dividend payout proposal. Since the stock price will significantly increase after the stock dividends payment proposal, the rights issue price would be higher than if the firm decide to pay cash dividend.

We therefore set our study in a Chinese context to study both the cash dividend and stock dividend payment patterns in China.[16]

3.2.3 Possible Determinants of Cash Dividend Payout Policy

Since the advance of the disappearing dividend puzzle by Fama and French (2001), a number of studies take on the challenge to explain the disappearing dividends puzzle. For instance, Grullon and Michaely (2002) attribute the disappearing dividends to the prevailing shares repurchase during that period. Alternatively, Amihud and Li (2006) employ dividends signalling theory to explain the decreasing percentage of dividends payers. In their study, the increased proportion of well-informed institutional investors leads to a decrease in the information contents of dividends announcement, which accounted for the decreasing incidence of dividends payment. This study focuses on the following three possible explanations: (1) Catering theory, which indicates that managers choose dividend policy under investors' pressure; (2) Managerial ownership, which implies that managers choose dividend policy for their own interest; (3) Board characteristics, which indicates that the dividend policy is decided by the board.

3.2.3.1 Catering Theory and Cash Dividend Payout Policy

Baker and Wurgler (2004b) put forward the catering theory that sheds light on the disappearing dividends puzzle. According to this theory, managers execute the dividend policy that caters to irrational investors' demand to boost their stock price above the fundamentals. They would choose to pay dividends when investors prefer dividends payers, likewise, they would omit dividends when investors put a discount on dividends payers. They construct the dividend premium to measure the prevailing

[16] In China, the corporation law prohibits listed firms from buy-back their shares with some exceptions from 1993. As a result, seldom firms in China engage in the share repurchase. Therefore, the share repurchase in China is not studied in this paper.

investor demand for dividend payers. The dividend premium is defined as the difference between the book-value-weighted market-to-book ratios of dividend payers and nonpayers. When the dividend premium is positive, there exists a general stock market incentive to pay dividends, and an incentive not to pay when it is negative. Also, they note that this measure of investor demand for dividend payers would reflect both rational clientele demands as well as any investor sentiment for payers. Baker and Wurgler (2002) examine several alternative reasons such as asymmetric, dividends clienteles, and catering incentives and claimed that dividends premium, the proxy for catering incentives, holds the best explanatory power for the time-series fluctuations in the propensity to pay dividends.

A number of studies empirically test the catering theory in different markets and report mixed evidence toward this behavioural finance theory. The following summarizes key research into the applicability of catering theory.

Catering theory finds support in some studies such as Baker and Wurgler (2004a) and Ferris et al. (2006). Based on the 1776 U.S. firm-level observations during 1963-1977 and 3793 observations during 1978-2000, Baker and Wurgler (2004a) recognize four trends in the propensity to pay over the period 1963-2000 with Fama and French (2001)'s method and find that the four trends in propensity to pay coincide with the changes in catering incentive. The positive dividends premium is observed to line up with increasing propensity to pay and the negative premium corresponds to a declining propensity to pay. Further, they suggest that the estimated coefficient of catering incentives in the regression of fluctuations in propensity to pay is significantly positive, indicating that catering incentive plays an important role in explaining the variance in the unexplained portion of dividends payers. In line with Baker and Wurgler (2004a)'s evidence, Kale et al. (2012) analyse several dividends theories such as signalling, agency cost and catering theory with the Compustat data of 5875 U.S. firms over the period 1979-1998 and concluded that dividends premium, the proxy for catering incentive, is positively related to dividends initiations. As to the evidence in other countries, Ferris et al. (2006) study the dividend policy in UK and identify a remarkable decline in the portion of dividends payers from 75.9% in 1988 to 54.5% in

2002 and proved that after firms' characteristics controls, catering incentive still hold a significant explanatory power over the changes in propensity to pay. Studies by Ali and Urcan (2012), Hsieh and Wang (2006) and Twu and Shen (2006) on dividends payment also find evidence for catering.

However, some scholars cast doubt on catering theory such as Savovy and Weber (2006) and Denis and Osobov (2008). Julio and Ikenberry (2004) identify a considerable decline in the incidence of dividends payers with US firm-level observations during the period 1984-1999 and claim that catering incentive is poor in explaining the declining percentage of dividends payers after controlling for age and size. Similar evidence is reported with international data. Savovy and Weber (2006) select German firm data over the period 1982-2003 and find no evidence that support catering theory even after controls for current growth rate to avoid multicollinearity. Ferris et al. (2006)'s conclusion is criticized by Denis and Osobov (2008) that the dividends premium documented in Ferris et al. (2006) varies inconsistently with the fluctuations in propensity to pay during the period 1995-2000 only with the exception of 2001 and 2002 where its decline accords with the reduction in propensity to pay. Thus, Denis and Osobov (2008) argue that the significant explanatory power of catering incentives reported in Ferris et al. (2006) is driven by the coincidence that occurred only in the last two years of their full sample period.

Meanwhile, there are others who argue that the effectiveness of catering theory depends on some external factors such as the government regime. With a large dataset of firm-level observations from 23 countries over the period 1995-2003, Ferris et al. (2009) suggest that firms cater to investors' sentiment in common law countries but not in civil law countries. The authors point out the difference in results garnered from the different levels of investors' protection. Compared with those in civil law countries, shareholders in common law countries hold more protection and have more right to force managers to cater to their demand. Whereas, this finding is inconsistent with that of Denis and Osobov (2008), who document that the estimated coefficients of catering incentive are insignificant in common law countries and significantly negative in civil law countries. By contrast, the estimates reported in Denis and Osobov

(2008) are in line with the agency-cost explanation of dividends payment. Alternatively, Renneboog and Szilagyi (2006) document the application of catering theory in Dutch-listed companies due to their special structure and mechanisms.

Thus, it could be inferred that the current literature on catering theory have not come to an agreement, and the robustness of catering theory is still in doubt.

3.2.3.2 Managerial Stake and Cash Dividend Payout Policy

Since the early 1980s, there are extensive theoretical and empirical studies investigating how the managerial stake influences the corporate dividend payment policy. (Weisbenner, 2000; Bettis et al., 2001; Fenn and Liang, 2001; Kahle, 2002; Hu and Kumar, 2004; and Brown et al., 2007) The signalling model for dividends payment suggests that managers choose dividend policy to convey private information to investors (John and Williams 1985).

The traditional agency cost theory of dividend payouts, introduced by Rozeff (1992), states that companies with more managerial participation pay fewer dividend. He argues that higher concentration of managerial stake could curtail and impede the agency cost by aligning the interests of managers and shareholders. Meanwhile, dividend payouts also serve as a partial remedy to the manager-shareholder conflicts. One the one hand, paying excessive funds to shareholders through cash dividends or share repurchase could reduce the amount of free cash flows that managers could otherwise spend on low profit projects. (Jensen, 1986; Neves, 2014). On the other hand, distributing funds to shreholders via dividends payouts forces managers to raise external funds for new projects and, consequently, to undergo the scrutiny and disciplining effects of fund providers more frequently (Easterbrook, 1984). Thus, managerial ownership and dividend policy are viewed as substitutive mechanisms that reduce the agency costs associated with the separation of ownership and control. That is, the increase in dividend payouts would reduce the need for managerial ownership to control agency conflicts and thus it is expected that the managerial stake is inversely related with dividend policy. Furthermore, in fact, managers with high level of managerial stake would try to accumulate more funds by lowering cash dividend payments to increase private consumption (Ehsan et al, 2013). Grossman and Hart (1988) document that large insiders may have a preference for retained earnings over dividends for rent extraction. Hence, firms with higher managerial ownership is supposed to pay few dividends. This negative association between managerial ownership and dividend payouts is empirically supported by Agrawal and Jayoraman (1994). They find that management in the firms with high level of managerial stake prefers not to declare more dividends. Similar results are found in Chen and Steiner (1999), Crutchley and Hansen (1989), Holder et al. (1998), and Truong and Heaney (2007).

Different from conclusions drawn from the agency theory for dividend payouts, another strand of literature states that managerial ownership is positively associated with dividend payouts, as managerial ownership could reduce the agency costs of free cash flow. Fenn and Liang (2001) argue that managerial ownership is associated with higher dividend payouts by firms with high agency costs (low managerial ownership, and low investment opportunities and high free cash flow). They claim that managerial ownership helps align the interests of management and shareholders, this could help mitigate free cash flow problem and result in a higher dividend payouts. In a similar vein, White (1996) finds that firms with low level of managerial ownership are more likely to use the dividend-related compensation, and that this policy tends to cause higher dividend payments. This indicates the positive relation between managerial ownership and cash dividend payments.

The managerial entrenchment hypothesis states that the impact of managerial stake on dividend policy depends on the level of managerial stake. (Weston, 1979; Fama and Jensen, 1983; and Demsetz, 1983) When the level of managerial ownership is relatively low, managerial ownership could be used for the alignment of interests between shareholders and managers. Thus, in this case, managerial ownership and dividend payments are substitute mechanisms to relieve agency conflicts between managers and shareholders, and are therefore expected to be negatively correlated. (Neves, 2014) When the level of managerial ownership is relatively high, the augmentation of managerial ownership provides the managers more power and opportunities to pursue their personal interests, as it contributes to the reduction of the strict control imposed by shareholders. Hence, in this case, the additional agency costs associated with the managerial entrenchment (more power to managers) would be incurred and then the managerial ownership will positively related with dividend payment policy. In this vein of research, Schooley and Barney (1994) claim a significant non-linear relationship between dividend payments and managerial stake in US firms. Also, Short et al. (2002) and Farinha (2003) observe a U-shaped relationship between managerial stake and dividend payments among UK firms.

The research on the relation between managerial ownership and dividend payments among Chinese firms is limited. Liao and Fang (2004) examine how the managerial ownership reduces the company's internal agency conflicts between managers and shareholders. They find that managerial ownership positively impacts on dividend payments among firms with high agency cost, however, the relation is insignificant among firms with low agency cost. They also observe a positive relationship between managerial ownership and cash dividend payments among firms with high levels of state ownership. In addition, using a two-step least square method to analyse the relationship between managerial ownership and dividend payments in China, Yang (2008) find evidence which suggests that the cash dividend payout ratio is positively correlated with managerial stake. Chen and Ma (2005) study the relationship between cash dividend payments and managerial stake, they argue that managerial ownership should have a positive impact on dividend payments. However, adopting multiple research methods, they find that managerial ownership and cash dividend payments are not significantly correlated.

3.2.3.3 Board Structure and Cash Dividend Payout Policy

Current literature on the relation between board structure and dividend payouts offer two competing hypothesis. The substitution hypothesis advanced by La Porta et al. (2000a) states that firms with weaker board structure tend to pay more dividends. That is, firms with poor legal protections for minority shareholders will maintain high dividend payout ratio to compensate for the minority shareholders and increase their reputation. This hypothesis is supported by Jiraporn and Ning (2006), who find negative association between the strength of shareholder rights and dividend payouts. In a similar vein, Knyazeva (2008) observes that managers in weakly governed firms have fewer dividends cuts.

Another strand of literature states that better board structure could provide more protection for shareholders' interests and thus would more likely to pay dividends. The outcome hypothesis, proposed by La Porta et al. (2000a), asserts that better board structure tends to pay more dividends to reduce the managers' expropriation. Their empirical results support the outcome hypothesis by finding that countries with better board structure show higher level dividend payouts. This theory is in line with the agency cost theory of dividend payouts.

The agency cost theory of dividend payouts states that board of directors have substantial influence on the dividend payout policy (Farinha, 2003; Hu and Kumar, 2004). Board of directors is the ultimate internal governance mechanism in respect of protecting shareholders' interest. So the board should help alleviate agency problem between shareholders and managers. Meanwhile, one important area where the conflicts between shareholders and managers occurs is the dividend policy. (Easterbrook, 1984; Jensen, 1986)

Board of directors should serve as the guardian for shareholders. They are essential in monitoring the dividend policy as management need the approval of the board before making the final dividends payment decisions. The board should consider various factors such as long-term development before approving the dividend policy. So the board of directors is supposed to curtail the conflicts between management and shareholders over the dividends payment policy. Thus, firm with a powerful board (large board size) and greater board ownership (high board ownership) is more likely to pay dividend. However, the board may also be self-serving or join with the management to pursue their private wealth in expense of shareholders' interest, especially minority shareholders' interest.

Independent directors are in an essential position to monitor the management over dividend policy and thus alleviate conflicts between managers and shareholders. In the full glare of shareholders, directorial market and the public, independent directors need to serve for the interest of shareholders and the firm to enhance their reputation and managerial competence to the market. (Linck et al., 2009) Thus, independent directors would exercise judgment independently and free of management influence when deciding dividend payout policy. Kaplan and Reishus (1990) suggest that the board members in dividend reducing firms have reduced opportunity to serve on additional board seats.

Independent directors can effectively restrain the managers' opportunistic dividend payout policy in their own favour at the expense of shareholders. In recent years, in order to protect shareholders against management abuse and maximize firm value, the independence of the board is increasing (Linck et al., 2009). Therefore, it is expected that higher percentage of independent director on board improves internal supervision, facilitates management discipline. Hence, propensity to pay dividends is supposed to be positively associated with the proportion of independent directors. This is empirically supported by Sharma (2011), who studies the relationship between independent directors and propensity to pay dividends after controlling for the impact of managerial characteristics. The author finds that propensity to pay and board independence is positively related.

3.2.3.4 Risk and Cash Dividend Payout Policy

Studies on the relationship between risk and dividend policy indicate a negative relationship between risk and dividend payments. One strand of literature builds on the maturity theory proposed by Venkatesh (1989), which suggests that firm maturity, characterized by less risk, is able to motivate firms to pay dividends. This theory is supported by Grullon et al. (2002) work. Through investigating announcements of dividend reductions and increases by NYSE and AMEX listed firms over the period 1982 to 1993, Grullon et al. (2002) find that dividend changes are accompanied by the changes in systematic risk, and the increase in dividends leads to a decline in firm's systematic risk. Similar results are reported by Koch and Sun (2004).

Moreover, Fama and French (2001) suggest that the disappearing dividends puzzle over the period from 1978 to 1998 could be partly explained by the changes in firm characteristics over that period, and one of the pronounced changes is the decrease in the profitability of newly listed small firms during the same period. Thus it could be inferred that the increase in the risk level of newly listed firms partly leads to the decrease in the incidence of dividend payers.

Based on a large sample of US data from 1963 to 2000, Pástor and Pietro (2003) advocate that the increase in idiosyncratic risk prevailing in the 1990s is accompanied by the rise in cash flow risk, which is supposed to limit a firm's dividend payments. Meanwhile, Xu and Malkiel (2003) argue that the increased firm-specific risk reflects a firm's growth potential in the future; indicating that firms with increased idiosyncratic risk may decrease their dividend payments for the sake of future growth.

In a recent paper, Hoberg and Prabhala (2009) study the relationship between risk and dividend policy for US firms between 1963 and 2004 and find that both systematic and idiosyncratic risks could explain the disappearing dividends puzzle. They report that risk could explain roughly 40% of the decreasing incidence in dividend payers observed. Moreover, they argue that after accounting for risk, the explanatory power of catering incentive disappears for the US market. That is, the dividend premium, proxy for catering incentives, actually measures the risk difference between dividend-payers and non-dividend-payers. Nevertheless, this argument contradicts Bulan et al. (2007)'s evidence that catering incentive is significantly associated with fluctuations in the idiosyncratic adjusted propensity to pay. Kuo et al. (2013) adopt a large sample of world-wide data and report that risk has a negative impact on the probability of a firm being a dividend-payer. They conclude that catering incentives actually capture the risk difference between dividend payers and non-dividend payers.

3.2.3.5 Liquidity and Cash Dividend Payout Policy

Liquidity factors are also advanced recently to explain the puzzle in the US market. Banerjee et al. (2007) find that the liquidity could in part account for the changes in dividend payers. In markets with low liquidity, the high transaction costs influence investors to receive dividends rather than acquire the same amount of homemade dividends by selling their investment. Meanwhile, rational investors prefer liquid stocks and lower the valuation of illiquid stocks. Thus firms with low liquidity would more likely pay dividends to increase their valuation. This is empirically evidenced by Banerjee et al. (2007) with a large sample of US data over the period 1963-2003. Their findings are consistent with Bulan et al. (2007)'s observation that dividend initiations occur more frequently in illiquidity markets.

Thus, the liquidity variable is applied to test the prediction that stock liquidity is negatively related to dividend payment decisions. In this study, we adopt the turnover ratio (*ToR*), defined as the number of shares traded scaled by the number of shares outstanding, and is a widely-used proxy for liquidity.

3.2.3.6 Other Possible Determinants of Cash Dividend Payout Policy

Barclay et al. (1997) point out the significant relation between dividend policy and firm characteristic variables including size, profitability, and investment opportunities. These variables are significant in explaining the disappearing dividends in the US (Fama and French, 2001). Meanwhile, one of the specific characteristics of Chinese firms is the existence of state-owned enterprises. State-owned firms are supposed to be less likely to pay cash dividend (Wei and Xiao, 2009). Also, as in Jensen (1986), the optimal dividend policy is driven by motivation to distribute the firms' free cash flow.

It is widely argued that debt and dividends serve as the control mechanisms for agency-cost. (Grossman and Hart, 1980; Jensen, 1986; Rozeff, 1982) Debt and dividends could mitigate the information asymmetries between investors and firms, and also alleviate the conflict of interest between owner and managers. However, there are two opposing argument about the relation between debt and dividends. On the one hand, Jensen (1989) and Neves and Torre (2006) argue that debt and dividends are complementary mechanisms. In other words, both of debt and dividends should be used to solve the firm's inefficiency. This indicates that firms with higher leverage are more likely to pay dividend. On the other hand, the substitution hypothesis suggests that the dividend payments of firms with higher leverage is less valuable. (López Iturriaga and Rodríguez Sanz, 1999; Lozano et al., 2002; Moh'd et al., 1998). Also, the debt could potentially restrict firms' dividend payments, especially the cash dividend payouts. (Kalay, 1982) This is emprically supported by Wei and Xiao (2009)'s finding that debt is negatively related with cash dividend payouts in China. This implies that firms with lower leverage are more likely to pay cash dividend.

DeAngelo et al. (2004) find that dividends in the US tend to be more concentrated among a small number of large payers. To explain this phenomenon, DeAngelo et al. (2006) advance the life-cycle theory, where firms adopt the optimal dividend policy in accordance with the evolution of their opportunity set. In the early years, firms pay fewer dividends as their investment opportunities exceed their internally generated capital. Conversely, in the later years, firms pay more dividends to mitigate the possibility of free cash flows being wasted due to internal funds exceeding investment opportunities. The life-cycle theory is empirically evidenced by DeAngelo et al. (2006) and Denis and Osobov (2008), who find a positive link between the propensity to pay dividends and the firms' earned-to-contributed equity mix.

3.2.4 Possible Determinants of Stock Dividend Payout Policy

The stock dividend payment has long been of the least understood phenomena in equity markets. The stock dividend simply increases the total number of shares without changing the proportionate shareholdings of investors or the firms' values. In a perfect market, stock dividend should not incur any economic consequences. However, although stock dividend does not change firms' value, it is still favourable among investor. Especially in Chinese stock market, research finds that stock dividend are more favourable over cash dividends. (Anderson et al., 2011; Cheng et al., 2009; Wei and Xiao, 2009). According to the dividend preference hypothesis advanced by Wei and Xiao (2009), state-owned shareholders prefer cash dividends to stock dividends for two reasons. First, state-owned shares could not be publicly traded and thus state-owned shareholders can't earn capital gains from trading stock dividends. Second, state-owned shareholders are always cash-thirsty and large and thus have the incentives and power to expropriate cash dividend to support their not-for-profit units. However, the facts that many firms under the control of a cash-preferring government are still paying stock dividends necessitate and investigation of the Chinese stock dividends payment. Numerous studies provide hypotheses to explain the mysteries of stock dividends payment including signalling, price range hypothesis. Most of the hypotheses try to explain the stock dividend payments from the perspective of managers or firms, limit studies try to explain the stock dividend payments from perspective of investors. So we study the relations between investors' preference for stock dividend with catering incentives for stock dividend. Also, we add to the Chinese stock dividends literature by extensively examining the time series of Chinese stock dividends.

3.2.4.1 Firms' Characteristics and Stock Dividend Payout Policy

The main hypothesis to explain the role of stock dividends is signaling hypothesis (Adaoglu and Lasfer, 2011; Desai and Jain, 1997; Ikenberry et al., 1996; Kunz and Rosa-Majhensek, 2008). According to signaling hypothesis, managers use stock dividends to convey a signal regarding their optimistic expectations to the investors. (Brennan and Copeland, 1988) Similarly, Foster III and Vickrey (1978) suggest that stock dividend announcements signal that they have insider information and are confident about firms' prospect. Specifically, McNichols and Dravid (1990) find that manager set distribution factor using private information, and that investors can infer the insider information from the observed distribution factor. Also, Elgers and Murray (1985) suggest that managers would not convey favorable information about future profitability unless there a sound basis for the optimism, and that the favorable expectation will eventually be reflected in earnings.[17] Therefore, it could be inferred from signaling hypothesis that firms with more profitability are more likely to pay stock dividend to signal favorable information. This is consistent with Anderson et al. (2011)'s finding that profitable firms tend to pay more stock dividend and cash dividend as returns to investors. However, Ikenberry and Ramnath (2002) document that the positive excess stock return following stock dividends announcement is caused by market under-reaction. Particularly, they suggest that analysts tend to underestimate the values of firms that pay stock dividends and that the underestimation will gradually revert when the firms announce the actual earnings.

[17] For the signalling equilibrium to be valid, there should exist a penalty for low-value firms to imitate the signalling decisions of high-value firms. For stock dividend, the retained earnings hypothesis is proposed to provide the penalty for false signalling (Grinblatt et al., 1984). The stock dividend payment will transfer the value of newly distributed shares from retained earnings to firms' capital account. And accounting principles require that firms must maintain a certain level of retained earnings before paying out cash dividends. Thus, the additional shares could further restrict the firms' cash dividend payment. Therefore, low-value firms that do not expect increased earnings will expect the restriction to be binding and thus find it costly to mimic the signals of high-value firms.

Nguyen and Wang (2013) find limited evidence that stock dividend in China convey positive information about future prospect.

Another motivation of stock dividend issuance is political costs. (Elgers and Murray, 1985) The large EPS would cause more attacks by labor or government, and thus managers may choose stock distribution to reduce these political costs. As it is assumed that these political costs are more likely and more severe for larger firms, managers of larger firms would be more likely to pay stock dividend to reduce these political costs. Lakonishok and Lev (1987) observe that firms distributing stock are much larger than firms not involving in stock distribution. However, Desai et al. (1998) argue that larger firms are less likely to distribute stocks as the larger firms prefer to maintain higher stock prices.

Further, cash substitution hypothesis states that firms may use stock dividend instead of cash dividend to conserve cash. (Anderson et al., 2011) The firms need to conserve cash for profitable investment opportunities, or the firms may see the deterioration in free cash flow. If the firms expect more investment opportunities, the firm would choose stock dividend instead of cash dividend to conserve cash. Thus, the positive relations between stock distribution and investment opportunities could be implied. Also, firms that lack of free cash flow would choose stock dividend payouts to conserve cash. Thus, it could be inferred that stock distribution and free cash flow are negatively related.

Meanwhile, retained earnings hypothesis states that accounting principles require that stock dividend paying firms to transfer an amount equal to the market value of distributed stock dividend from retained earnings to shareholder's equity in the financial statements. (Grinblatt et al., 1984) This results in the high cost on the firms. For example, creditors require that firms maintain a certain level of retained earnings. Thus, it is more costly for firms with less retained earnings to pay stock dividends. This could imply that firms with high retained earnings thus with high retained earnings to book value of equity are more likely to pay stock dividends.

For the relation between state ownership and stock dividend, state represents Chinese central or local governance, they prefer cash dividend over stock dividend as they can't earn capital gains from trading stock dividends, and also, they need cash to support their non-profit units. Cheng et al. (2009) find that firms with lower state ownership are more likely to pay stock dividend instead of cash dividend. It is suggested that firms with lower state ownership are more independent and thus more likely to conserve profit for future development. Thus, we could imply that state-owned firms are less likely to pay stock dividend.

3.2.4.2 Liquidity and Stock Dividend Payout Policy

Prior studies on the liquidity and stock dividend present different views on the implication of liquidity for companies' dividends payment decisions. Brennan and Tamarowski (2000) argue that higher liquidity could cause higher stock price, as increase in liquidity could decreases investors' required rate of return and further increases stock price. The direct evidence of the impact of liquidity on stock prices is given by Amihud et al. (1997). They investigate the price appreciation of 120 stocks on Tel Aviv Stock Exchanges, which were transferred from a daily "call auction" to the "variable price method" during the period 1987-1994. The "variable price method" is a mechanism where the iterated continuous trading sessions follows an open daily call auction. They find that the improved liquidity caused by this technical change in trading protocols is associated with a positive and permanent price appreciation. Meanwhile, according to the trading range hypothesis, the main purpose of stock dividends is to realign stock price into preferred price ranges. It is argued that stock trading in an optimal range could attract a wide array of interested investors and thus ease the possibility of the acquisition via equity financing. (Elgers and Murray, 1985) McNichols and Dravid (1990) higher stock distribution occurred in firms with higher stock price, indicating that managers select their stock distribution ratio to bring the price to its normal or optimal price range. In a similar vein, Nguyen and Wang (2013) study the stock dividends payment among Chinese firms and find that firms with higher stock prices are more likely to pay stock dividends. Thus, firms with higher liquidity are more likely to pay stock dividends in order to bring their shares prices into preferred range.

Also, stock dividends payment will increase the total number of shares outstanding. Holding everything else constant, the increase in the total number of shares outstanding will dilute some financial ratio, such as EPS, turnover in the long run. Anderson et al. (2011) find that total number of shares outstanding and stock dividend per share is negatively related and conclude that firms with large number of shares outstanding will avoid stock distribution. This indicates that firms with lower liquidity are less likely to pay stock dividends to avoid the increase in the total number of shares outstanding.

On the other hand, liquidity hypothesis postulates that the reduction in stock price after stock dividends would attract more small investors and thus enhance trading volume. (Copeland, 1979) However, the empirical evidence on the impact of stock dividends on liquidity is mixed and inconclusive. Dyl and Elliott (2006), Lipson and Mortal (2006) and Weld et al. (2009) report increased trading activities after stock distribution, which support the liquidity-based hypothesis on stock dividend. Lin et al. (2009) find the reduction in the incidence of no trading after stock distribution. Meanwhile, Lamoureux and Poon (1987), Conroy et al. (1990) and Desai et al. (1998) find that stock distribution significantly increase the proportional bid-ask spread, indicating that stock dividends payment decrease liquidity. Bechmann and Raaballe (2007) examine the stock distribution on stocks traded in Copenhagen Stock Exchange and find weak evidence that stock dividends could improve liquidity. Similarly, Adaoglu and Lasfer (2011) study the stock dividends payment in Turkey from 1986 to 2007 and report weak evidence for the liquidity effect. If stock dividend payments could increase firms' dividend, mangers in firms with low liquidity are likely to use stock dividends to enhance their liquidity. Thus, we would expect low-liquidity firms to be associated with higher likelihood of stock dividend payments. Thus, the relation between stock distribution and liquidity is inconclusive.

3.2.4.3 Corporate Governance and Stock Dividend Payout Policy

China, a fast-growing emerging market, establish Shanghai stock exchange in Dec 1989, and Shenzhen stock exchange in Apr 1991. Compared with other stock markets in developed countries, the Chinese stock market is relatively new and immature. Specifically, the corporate governance and investor protection in China is relatively weak than that in other developed countries. (Anderson et al, 2009) In Aug 2001, China Securities Regulatory Committee (CSRC) issues "Guides on Establishing the Independent Director System in Listed Companies", which require the percentage of independent board members in the board to be larger than 1/3. This policy provides better protections for shareholders, and thus enhances the corporate governance in the company. As stock dividend is mainly caused by the lack of cash or used to stimulate stock returns without increase firms' value, we would expect that stock dividend to be negatively related with the percentage of independent board and board size. However, Anderson et al. (2011) find that the independent director dummy is not significantly related with the stock dividend payouts in China. And they argue that the independent board in China as required by the policy may be more of a formality and thus could not impact the dividend payment policy.

3.3 Data and Methodology

3.3.1 Sample Selection and Data Description

Our sample consists of annual observations from 1999 to 2013 for all listed firms that meet the selection criteria. All firm-level financial, accounting and corporate governance information are obtained from Worldscope and CSMAR. Specifically, we obtain annual financial information on dividends per share, market-to-book value, earnings per share, assets per share, free cash flow, net debt, total equity, ratio of retained earnings to book value of equity, total assets, and market capitalization. We require the total assets figures to be available both in the current and in the preceding fiscal year. All the other items must be available in the current fiscal year. To compute the risk measures, we acquire daily information on closing stock price, market index price and risk-free rate. For the corporate governance information, we obtain the annual observations of ultimate controller, shareholdings of senior managers, number of board, shareholdings of board, duality, number of independent board, number of board meetings. Financial firms are excluded from the sample to avoid the possibility that these firms' dividend payment decisions may be restricted by regulations. (Fama and French, 2001) Utility firms are not excluded from our sample as there is no particular restriction on dividends payment for utility firms in China.[18]

We further exclude firms listed in the Small-and-Medium Section of the Shenzhen Stock Exchange, as the listing requirement for these firms are different from those for the main board. Also, we exclude firm with dual listing of H-shares, as the dividends decisions of these firms may be influenced by Hong Kong market practice.[19]

Our overall sample period extends from 1999 through 2013. Our sample period starts from 1999 and the corporate governance variables are not available before 1999. The 5-year data between 1999 and 2003 serves as the base period, while those 10-year data between 2004 and 2013 are used as out-of-sample period. Table 1 shows the summary statistics of all the variables used in the empirical tests. Table 1 shows that the average percentage of independent board in our sample is 32%. Meanwhile, the average board size for Chinese firms is around 9 and the average number of board meetings in a year is 8.50. Table 2 presents the correlation matrix for these variables. It illustrates the high correlation between ownership of senior managers and ownership of board.

[18] The results are qualitatively the same if we exclude utility firms from our sample.
[19] The firms with dual listing of B-shares are not excluded from our sample since the listing requirement, and regulations are similar for the A-share and B-share markets. The results are similar when we exclude firms with B-share from our sample.

Table 3.1: Summary Statistic. The table reports the summary statistics for market-to-book ratio (*M/B*), assets growth (*dA/A*), earnings-to-asset ratio (*E/A*), firms size (*SIZE*), whether a firm is state owned (*STATE*), free cash flow (*FCF*), debt-to-equity ratio (*D/E*), retained earnings-to-book equity ratio (*RE/BE*), systematic risk (*SYS*), idiosyncratic risk (*IDIO*), turnover ratio (*ToR*), percentage of shares held by senior managers (*SEN_OWN*), number of board members (*BD_SIZE*), percentage of shares held by board members (*BD_OWN*), percentage of independent board (*IND_PER*), yearly number of board meetings (*BD_MEETING*) for all Chinese non-financial companies.

Variable	Obs	Mean	Std. Dev.	Min	Max
M/B	18437	4.21	6.98	-19.78	78.73
dA/A	18437	0.05	0.47	-2.77	4.17
E/A	18437	0.05	0.09	-0.72	0.36
SIZE	18437	0.53	0.27	0.00	1.00
FCF	17880	3.61	15.56	-34.20	148.17
D/E	18437	1.29	2.03	-7.61	17.79
RE/BE	18094	0.00	1.44	-16.71	0.75
SYS	18077	0.02	0.01	0.00	0.04
IDIO	18077	0.02	0.01	0.01	0.15
ToR	18437	1.86	1.82	0.08	14.94
SEN_OWN	18293	0.26	0.79	0.00	4.38
BD_SIZE	18293	9.31	2.05	3.00	19.00
BD_OWN	18363	0.41	1.06	0.00	4.50
IND_PER	18282	0.32	0.12	0.00	0.80
BD_MEETING	18400	8.50	3.39	1.00	57.00

Table 3.2: Correlation Matrix. The table reports the correlation matrix for market-to-book ratio (*M/B*), assets growth (*dA/A*), earnings-to-asset ratio (*E/A*), firms size (*SIZE*), whether a firm is state owned (*STATE*), free cash flow (*FCF*), debt-to-equity ratio (*D/E*), retained earnings-to-book equity ratio (*RE/BE*), systematic risk (*SYS*), idiosyncratic risk (*IDIO*), turnover ratio (*ToR*), percentage of shares held by senior managers (*SEN_OWN*), number of board members (*BD_SIZE*), percentage of shares held by board members (*BD_OWN*), percentage of independent board (*IND_PER*), yearly number of board meetings (*BD_MEETING*) for all Chinese non-financial companies.

	M/B	***dA/A***	***E/A***	***SIZE***	***FCF***	***D/E***	***RE/BE***	***SYS***	***IDIO***	***ToR***	***SEN_OWN***	***BD_SIZE***	***BD_OWN***	***IND_PER***	***BD_MEETING***
M/B	1.00														
dA/A	-0.11	1.00													
E/A	-0.12	0.24	1.00												
SIZE	-0.11	0.05	0.30	1.00											
FCF	-0.05	-0.05	0.07	0.26	1.00										
D/E	0.49	-0.10	-0.28	-0.06	0.07	1.00									
RE/BE	-0.40	0.06	0.01	0.18	0.06	-0.31	1.00								
SYS	-0.07	-0.05	-0.09	-0.10	-0.08	-0.02	0.03	1.00							
IDIO	0.12	0.06	0.01	-0.08	-0.08	0.07	-0.03	0.37	1.00						
ToR	0.00	0.02	0.06	-0.06	-0.12	0.01	0.03	0.33	0.39	1.00					
SEN_OWN	-0.05	0.04	0.08	-0.21	-0.05	-0.11	0.02	0.00	0.06	0.11	1.00				
BD_SIZE	-0.06	-0.02	0.02	0.20	0.12	0.02	0.03	-0.03	-0.07	-0.08	-0.12	1.00			
BD_OWN	-0.05	0.03	0.10	-0.22	-0.06	-0.12	0.02	0.00	0.07	0.14	0.85	-0.13	1.00		
IND_PER	-0.12	0.06	0.01	0.00	0.08	0.07	-0.01	0.11	0.13	0.15	0.15	-0.15	0.17	1.00	
BD_MEETING	0.01	0.06	-0.01	0.06	0.03	0.08	0.08	0.10	0.11	0.09	0.03	-0.05	0.05	0.13	1.00

Table 3.3: Number Of Cash-Dividend-Paying Firms, Non-Cash-Dividend-Paying Firms and the Total Sample of Chinese Firms, 1999-2013. The sample includes all the Chinese non-financial companies over the period 1999-2013 that satisfy the data availability requirements. A firm is a dividend-payer if it has a positive dividend per share and otherwise it is a non-payer.

Year	Payers	Non-payers	Total
1999	298	317	615
2000	391	313	704
2001	556	268	824
2002	679	219	898
2003	736	261	997
2004	535	530	1065
2005	537	630	1167
2006	520	658	1178
2007	641	609	1250
2008	701	655	1356
2009	705	703	1408
2010	780	723	1503
2011	1018	707	1725
2012	1152	688	1840
2013	1316	591	1907

Figure 3.1: Number of Dividend-Paying Firms, Number of Total Firms, and Percentage of Dividend-Paying Firms among Chinese Firms, 1999-2013. The sample includes all the Chinese non-financial companies over the period 1999-2013 that satisfy the data availability requirements. Firms classified as payers have positive dividends per share.

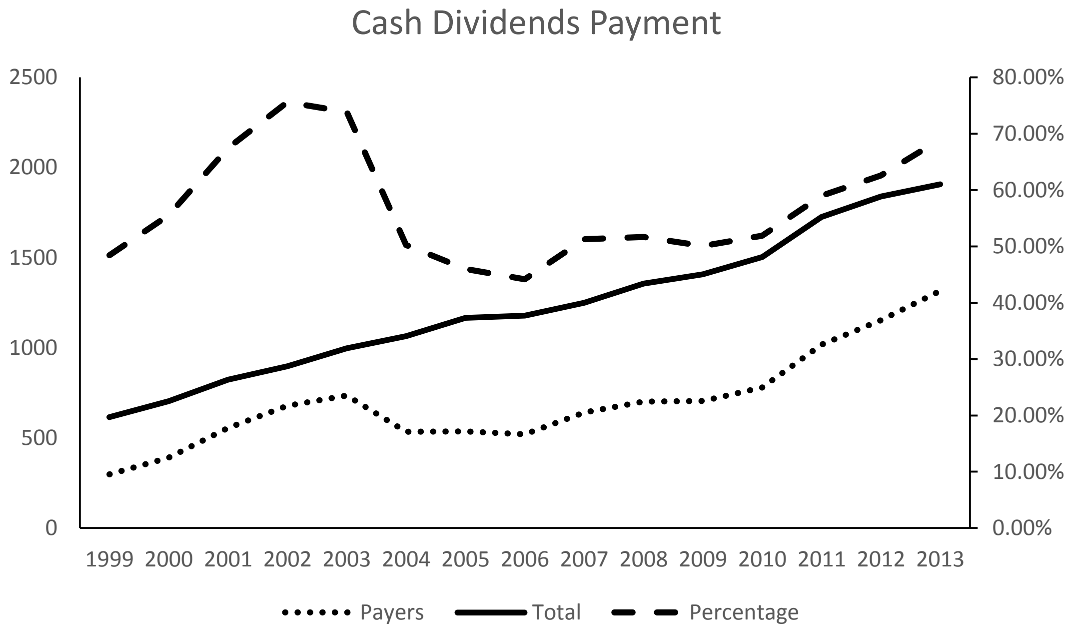


Table 3.3 and Figure 3.1 present the percentage of cash dividends payers in China from 1999 to 2013. It shows that during the period 1999 to 2002, the percentage of cash-dividend-payers among Chinese firms increase substantially from 48.46% in 1999 to 75.61% in 2002, then falls sharply to the nadir of 44.14% in 2006. The figure also depicts that the proportion of firms paying dividends fluctuates around 51% during the period 2007-2010, before increasing to then 69.01% in 2013.

Table 3.4: Number of Stock-Dividend-Paying Firms, Non-Stock-Dividend-Paying Firms and the Total Sample Of Chinese Firms, 1999-2013. The sample includes all the Chinese non-financial companies over the period 1999-2013 that satisfy the data availability requirements. A firm is a stock-dividend-payer if it has a positive stock dividend per share and otherwise it is a non-payer.

Year	Payers	Non-Payers	Total
1999	85	530	615
2000	86	618	704
2001	67	757	824
2002	44	854	898
2003	79	918	997
2004	48	1017	1065
2005	55	1112	1167
2006	77	1101	1178
2007	114	1136	1250
2008	67	1289	1356
2009	93	1315	1408
2010	97	1406	1503
2011	61	1664	1725
2012	43	1797	1840
2013	45	1862	1907

Figure 3.2: Number of Stock-Dividend-Paying Firms, Number of Total Firms, and Percentage of Stock-Dividend-Paying Firms among Chinese Firms, 1999-2013. The sample includes all the Chinese non-financial companies over the period 1999-2013 that satisfy the data availability requirements. Firms classified as stock-dividend-payers have positive stock dividends per share.

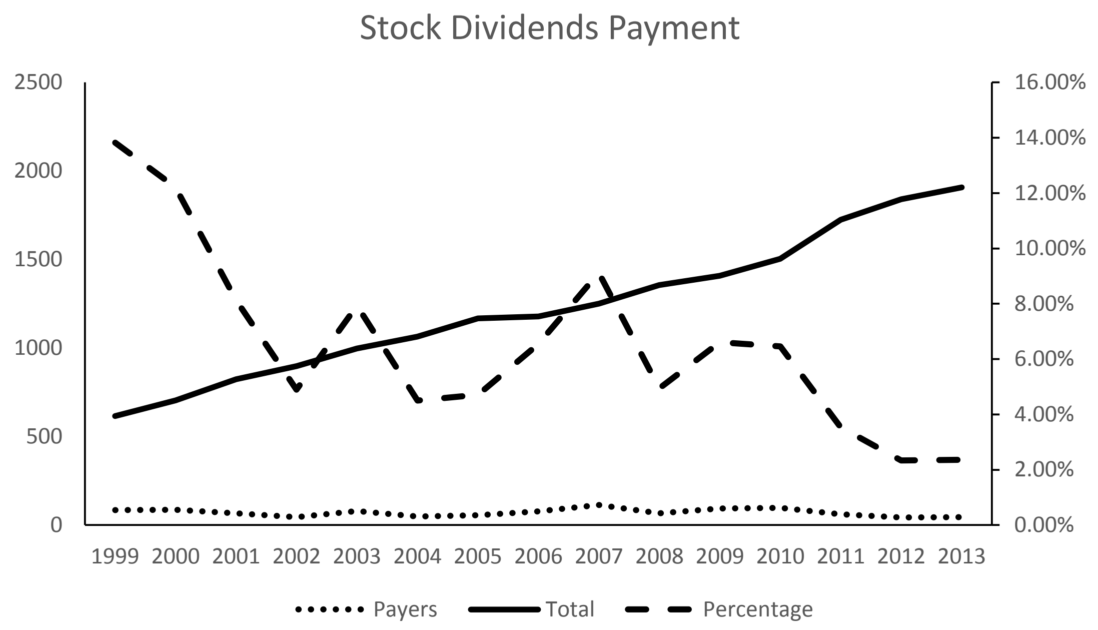


Table 3.4 and Figure 3.2 illustrate the stock dividends payment in China over our sample period 1999-2013. Overall, the percentage of stock dividend payers shows dramatically decreasing trend from 13.82% in 1999 to 2.36% in 2013. Specifically, the proportion of stock dividends payers decreases from 13.82% in 1999 to 4.90% in 2002, then it fluctuates around 5% until 2010. After that, it declines to 2.34% in 2012 and 2.36% in 2013.

Table 3.5: Cash Dividend Premium, 1999-2013. A firm is a dividend-payer if it has a positive dividend per share and otherwise it is a non-payer. The dividend premium is the log difference between the book-value-weighted market-to-book ratio of payers and that of non-payers.

Year	Payers	Non-Payers	DP
1999	4.07	4.70	-0.15
2000	4.44	4.66	-0.05
2001	4.67	5.29	-0.13
2002	3.55	4.71	-0.28
2003	2.74	3.58	-0.27
2004	2.30	2.71	-0.16
2005	1.63	1.66	-0.02
2006	2.17	2.32	-0.07
2007	4.21	4.05	0.04
2008	3.09	3.15	-0.02
2009	3.32	3.31	0.00
2010	2.78	2.88	-0.04
2011	3.32	3.58	-0.08
2012	2.40	2.56	-0.06
2013	2.05	2.28	-0.11

Table 3.6: Stock Dividend Premium, 1999-2013. A firm is a stock-dividend-payer if it has a positive dividend per share and otherwise it is a non-payer. The stock dividend premium is the log difference between the book-value-weighted market-to-book ratio of payers and that of non-payers.

Year	Payers	Non-Payers	SDP
1999	5.56	4.62	0.19
2000	5.98	5.13	0.15
2001	5.10	5.39	-0.06
2002	4.10	3.91	0.05
2003	3.27	2.95	0.10
2004	2.71	2.47	0.09
2005	1.79	1.59	0.12
2006	2.33	2.17	0.07
2007	4.76	4.26	0.11
2008	4.04	3.14	0.25
2009	3.95	3.55	0.11
2010	2.93	2.59	0.12
2011	3.79	3.13	0.19
2012	2.92	2.54	0.14
2013	3.13	2.27	0.32

Table 3.5 presents book-value weighted market-to-book ratio for cash-dividend-payers and non-payers as well as the corresponding cash dividend premium each year from 1999 through 2013. Dividend premium, estimated as the difference between the market values of dividend-payers and non-dividend-payers, can proxy investors' preference for dividend-payers and capture the presence of possible catering incentives (Baker and Wurgler, 2004a, b). From Table 3.5 we see that the cash dividend premium takes negative values before 1995, and then it fluctuates around zero until 2009. After that, the cash dividend premium tends to be negative again. In our sample period, the cash dividends premium is generally negative. Table 3.6 presents the stock dividend premium over the period 1999-2013. Unlike the cash dividend premium, stock dividends premium is positive throughout most of our sample period. This indicates that investor prefer stock dividend payers to non-stock-dividend payers in Chinese stock market.

3.3.2 Methodology

Following Fama and French (2001), we employ logit models to examine the role of various factors in explaining the probability of paying cash dividends and stock dividends. The logit regressions takes the following form:

$$CD_{it} = logit\ \Big(a + b\frac{M}{B}_{it} + c\frac{dA}{A}_{it} + d\frac{E}{A_{it}} + \ eSIZE_{it} + fSTATE_{it} + gFCF_{it} + h\frac{D}{E}_{it} + i\frac{RE}{BE}_{it} + jSYS_{it} + kIDIO_{it} + lToR_{it} + mSEN\_OWN_{it} + nBD\_SIZE_{it} + 0BD\_OWN_{it} + pBD\_MEETING_{it} + qIND\_PER_{it} + rDUALITY_{it}\Big) + \mu_{it} \quad (1)$$

$$SD_{it} = logit\ \Big(a + b\frac{M}{B}_{it} + c\frac{dA}{A}_{it} + d\frac{E}{A_{it}} + \ eSIZE_{it} + fSTATE_{it} + gFCF_{it} + h\frac{D}{E}_{it} + i\frac{RE}{BE}_{it} + jSYS_{it} + kIDIO_{it} + lToR_{it} + mSEN\_OWN_{it} + nBD\_SIZE_{it} + 0BD\_OWN_{it} + pBD\_MEETING_{it} + qIND\_PER_{it} + rDUALITY_{it}\Big) + \mu_{it} \quad (2)$$

where CD_{it} is set to one when firm *i* pays cash dividends in year *t*, and zero otherwise. SD_{it} is set to one if the firm *i* pays stock dividends in year t, otherwise, it equals to 0. The coefficients of the models are estimated as time series averages of Fama and MacBeth (1973)'s annual cross-sectional regressions with Newey-West *t* statistics. The independent variables in this logit model can be categorized into four groups: a.) the Fama and French (2001) firm characteristic variables (market-to-book ratio (M/B_{it}), asset growth (dA/A_{it}), earnings-to-assets ratio (E/A_{it}), and size percentile ($SIZE_{it}$)), leverage proxied by the debt-to-equity ratio (D/E_{it}) and free cash flow(FCF_{it}); b.) the state variable ($STATE_{it}$); c.) the life-cycle variable proxied by the ratio of retained earnings to book value of total equity (RE/BE_{it}); d.) liquidity proxied by the stock turnover ratio (ToR_{it}); d.) risk variables including systematic risk (SYS_{it}) and idiosyncratic risk ($IDIO_{it}$); e.) the percentage of shares held by senior managers (SEN_OWN_{it}); and f.) the board variables including number of board members

(BD_SIZE_{it}), percentage of shares held by board members (BD_OWN_{it}), number of board meetings in a year ($BD\_MEETING_{it}$), percentage of independent board (IND_PER_{it}) and duality ($DUALITY_{it}$). Below we explain the variables used in the logit regression.

To investigate the determinants of the dividend payout trends, we include in our analysis size, profitability and investment opportunity variables, as defined in Fama and French (2001). Size characteristics are captured by the market capitalization percentile ($SIZE_{it}$). This variable is calculated as the fraction of firms with equal or smaller market value than firm *i* in a given year *t*. Earnings-to-assets ratio is considered as a proxy for profitability and the measure of a firm's investment opportunity is constructed with market-to-book value and asset growth. The latter is measures as, the proportionate change in total assets for year *t*. Meanwhile, one of the specific characteristics of Chinese firms is the existence of state-owned enterprises. Thus, we include state as a dummy variable coded 1 if ultimate shareholder is the government and 0 otherwise. We include free cash flow (*FCF*) to test the impact of free cash flow on Chinese firms' dividends payout policy. Additionally, since leverage can impact a firm's dividend policy (Neves and Torre, 2006), we include the debt-to-equity ratio in our analysis. Also, we adopt earned-to-contributed equity mix to proxy for a firm's life-cycle stage. This proxy measures the proportion of the internally generated to firm's contributed capital, and calculated as the ratio of retained earnings to the book value of total equity (*RE/BE*).

In order to examine the role of risk factors in explaining dividend policy, our analysis includes systematic risk and idiosyncratic risk variables. Following Hoberg and Prabhala (2009), the former is defined as the standard deviation of the predicted value from a CAPM regression while the latter is defined as the standard deviation of residuals from the above regression. Meanwhile, the liquidity variable is applied to test the prediction that stock liquidity is negatively related to dividend payment decisions. In this study, we adopt the turnover ratio (*ToR*), defined as the number of shares traded scaled by the number of shares outstanding, and is a widely-used proxy for liquidity.

To test the relation between dividend payment decisions and senior managerial ownership, we include the percentage of shares held by senior managers (*SEN_OWN*). Also, as board characteristics are important determinants of cash dividend payments, we incorporate the size of board (*BD_SIZE*), board independence (*IND_PER*), stock ownership of board members (*BD_OWN*), whether the CEO and the chairman positions are occupied by the same or two different individuals (*Duality*), and the number of board meetings in a year (*BD_MEETING*).

Then we estimate the propensity to pay to pay cash dividends (PTPC) and stock dividends (PTPS) based on the logit regressions. We statistically test for the presence of catering hypothesis by regressing the changes in propensity to pay against the lagged dividend premium and relevant control variables. The regression is defined as follows:

$$\Delta PTPC_t = \alpha + \beta CP_{t-1}^{D-ND} + \theta FC_t + \varepsilon_t \qquad (3)$$
$$\Delta PTPS_t = \alpha + \beta SP_{t-1}^{D-ND} + \theta FC_t + \varepsilon_t \qquad (4)$$

where $\Delta PTPC_t$ is the changes in propensity to pay cash dividends, $\Delta PTPS_t$ is the changes in propensity to pay stock dividends, CP_{t-1}^{D-ND} is the lagged cash dividend premium (capturing catering incentives), SP_{t-1}^{D-ND} is the lagged stock dividend premium and FC_tdenotes the 2007-2009 financial crisis dummy variable. The financial crisis dummy is equal to one in the years from 2007 and captures the impact of the unexpected economic recession initiating in 2007 on a firm's dividend policy. In Figure 3.2, we notice an upward trend in the propensity to pay cash dividends as firms prefer to pay cash dividends to increase the confidence of investors during the financial crisis. Thus, the financial crisis dummy is expected to have a positive influence on the cash dividend payout decisions.

3.4 Empirical Results for Cash Dividend Payouts

3.4.1 Results of the Logit Regression for Cash Dividends Payouts

Table 3.7 presents the estimated coefficients and Newey-West t-statistics for the logit regression in Equation (1) that predicts the probability of a firm being a dividend-payer. The tables including 9 columns, with each column covering one specification with different explanatory variables included in the regression. Column (1) of Table 3.7 reports the estimates from the baseline regression with firm characteristic explanatory variables advanced by Fama and French (2001) and state variable. In the sample period considered, all the firm characteristic variables are significant. That is, the probability for a firm paying dividends increases with the decrease in market-to-book value and asset growth, and the increase in earnings-to-assets ratio and size percentile. This confirms Fama and French (2001)'s hypothesis that larger, more profitable firms with less investment opportunity are more likely to pay dividends. Also, it shows that the state variable could not significantly affect the dividend payments in our sample period.

Columns (2), (3) and (4) of Table 3.7 report the results when the free cash flow, leverage ratio and earned-to-contributed equity mix are respectively added to the baseline model. The results in Column (2) and Column (3) of Table 3.7 show insignificant coefficient for free cash flow and leverage in our sample period. This means that the leverage of firms does impact cash dividend payout policy among Chinese firms. This means that free cash flow and leverage ratio provide no independent impact on the dividend practice among Chinese firms. This is different from Neves and Torre (2006) evidence from the US market that debt-to-equity ratio, proxy for leverage, predicts firms' cash dividend payout pattern. Further, in Column (5) of Table 4, we see that the earned-to-contributed equity mix variable has significance effect at 1% in predicting dividend policy. This means that the life-cycle theory advanced by DeAngelo et al. (2006) explains some of the variations in dividend payment decisions among Chinese companies. This suggests that more mature firms are more likely to pay dividends. This supports DeAngelo et al. (2006)'s and Denis and Osobov (2008)'s prediction that the life-cycle proxy should be positively related to the dividend payouts. Therefore we conclude that life-cycle can explain the dividend payment decisions among Chinese firms. However, we find no evidence of explanatory power of free cash flow and leverage in dividend payment decisions in the China.

The specification in Column (5) reports the estimates for stock liquidity measure stock turnover, firm characteristics, and state explanatory variables. The results show that turnover is negative and significant after controlling for firm characteristic variables in the sample period considered. This means that in for the whole sample period stock liquidity is negatively associated with a firm's probability of being a dividend payer. This confirms the evidence observed in the US market by Banerjee et al. (2007) that liquidity as proxied by turnover ratio can explain the likelihood of a firm paying dividends in AMEX/NYSE.

In Column (6), we examine whether risk can explain the probability of being a dividend payer in the Chinese market. When incorporating risk variables into the regression we find that idiosyncratic risk has strong explanatory power. Those significantly negative coefficients on risks are in line with Kuo et al. (2013)'s finding in the world-wide markets that firm-specific risk has a negative impact on the probability of a firm being a dividend-payer. Furthermore, for our sample period considered, the risk variables do not reduce the significance of the standard firm characteristics variables, indicating that firm characteristics and risk are important variables in explaining dividend payments. Therefore, the findings suggest that as in the case of the other markets, risks inversely affect the probability of Chinese firms being dividend-payers.

In Column (7), we find that in our sample period considered the senior manager variable is insignificant. This means that proportions of shares held by senior managers is not an important determinant of being a dividend payer, this is inconsistent with Fenn and Liang (2001) findings.

The specification in Column (8) reports the estimates for baseline explanatory variables and board's characteristics variables including number of directors on the board, the percentage of shares held by the board members, number of board meetings held in a year, percentage of independent board and duality. The results show that board size and percentage of board ownership are positive and significant after controlling for firm characteristic variables in the sample period, and they do not alter the significance of the firm characteristic variables of Fama and French (2001). Meanwhile, number of board meetings is negatively related to the firms' dividend payment decisions. Further, this indicates that firm with a powerful board (BOARD_SIZE) and greater board ownership (BOARD_OWN) is more likely to pay dividend. Meanwhile, duality and percentage of independent board is not significantly related to the dividend payments in our sample period.

In Column (9) of Table 3.7, we include free cash flow, leverage, lifecycle, risk, liquidity, senior variable and board variables along with the baseline variables and find that life-cycle, risk, liquidity and board variables still hold significant explanatory power in the sample period considered, even after including firm characteristic variables. Therefore, lifecycle, risk, liquidity and board variables provide additional information to the basic firm characteristic variables in explaining the probability of being a dividend payer, and hence are important determinants of dividend policy.

Table 3.7: Logit Estimation Explaining the Probability of Being a Cash-Dividend-Payer, 1999-2013. This table reports the logit regression results using Fama and MacBeth (1973) style estimation, with Newey–West t statistics reported in parentheses. The dependent variable is equal to one if the firm pays dividend that year and zero otherwise. The explanatory variables are market-to-book ratio (*M/B*), assets growth (*dA/A*), earnings-to-asset ratio (*E/A*), size percentile (*SIZE*), whether a firm is state owned (*STATE*), free cash flow (*FCF*), leverage ratio (*D/E*), retained earnings-to-book equity ratio (*RE/BE*), liquidity measure proxied by turnover ratio (*ToR*), systematic risk (*SYS*), idiosyncratic risk (*IDIO*), percentage of shares held by senior managers (*SEN_OWN*), number of board members (*BD_SIZE*), percentage of shares held by board members (*BD_OWN*), percentage of independent board (*IND_PER*), yearly number of board meetings (*BD_MEETING*) and whether the CEO and the chair of the board of directors are the same person (*DUALITY*). Columns (1) - (9) report the estimates of the various logit regressions with Fama and French (2001) firm characteristic variables, state owner proxy and other explanatory variables. *** indicates significance at 1%, ** indicates significance at 5%, * indicates significance at 10%.

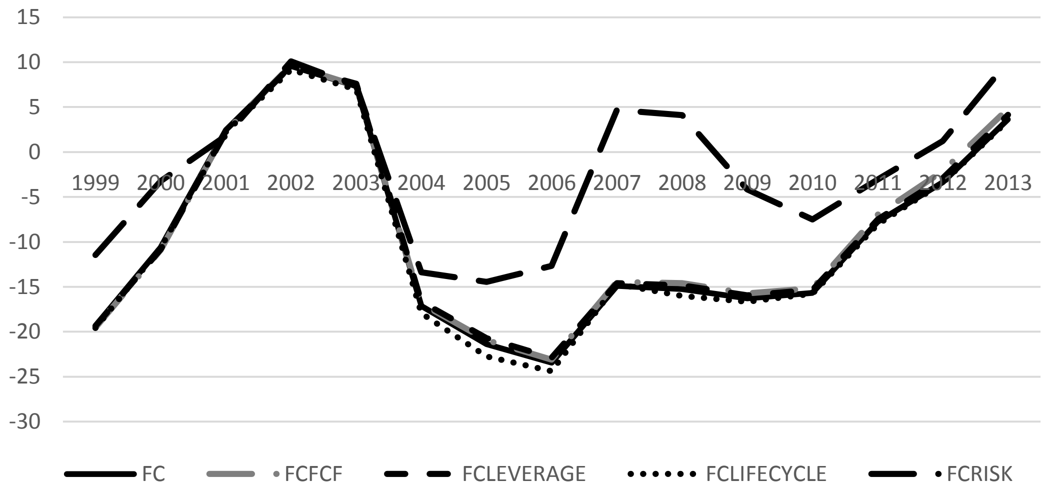
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
M/B	-0.069***	-0.069***	-0.065***	-0.089***	-0.053***	-0.069***	-0.070***	-0.073***	-0.065***
	(-4.35)	(-4.29)	(-4.21)	(-6.89)	(-3.95)	(-4.22)	(-4.14)	(-4.40)	(-6.00)
dA/A	-0.551***	-0.549***	-0.539***	-0.868***	-0.562***	-0.552***	-0.525***	-0.508***	-0.818***
	(-4.63)	(-4.66)	(-4.68)	(-4.63)	(-4.62)	(-4.70)	(-4.60)	(-4.18)	(-4.26)
E/A	7.986***	8.110***	7.866***	5.469***	8.582***	8.027***	7.605***	7.592***	4.792***
	(6.18)	(6.28)	(6.22)	(4.42)	(6.25)	(6.26)	(6.15)	(6.13)	(3.92)
SIZE	1.660***	1.595***	1.673***	1.044***	1.553***	1.658***	1.815***	1.819***	1.068***
	(10.52)	(10.83)	(10.56)	(8.87)	(9.89)	(10.79)	(10.51)	(10.33)	(10.90)
STATE	-0.022	-0.028	-0.013	0.000	-0.050	-0.044	0.130*	0.147**	0.105
	(-0.30)	(-0.38)	(-0.19)	(0.01)	(-0.65)	(-0.59)	(2.11)	(2.59)	(1.73)
FCF		0.001							-0.002
		(0.18)							(-0.68)
D/E			-0.037						-0.083***
			(-1.64)						(-3.27)
RE/BE				2.631***					2.596***
				(4.95)					(4.87)
SYS					15.846				-17.000*
					(1.60)				(-2.11)
IDIO					-51.131***				-30.843***
					(-6.52)				(-4.45)
ToR						-0.079**			-0.071**
						(-2.79)			(-2.72)
SEN_OWN							2.801		2.525
							(1.31)		(1.24)
BD_SIZE								0.052***	0.047***
								(4.42)	(3.67)
BD_OWN								0.292***	-0.041
								(3.69)	(-0.32)
BD_MEETING								-0.031***	-0.013**
								(-4.82)	(-2.26)
IND_PER								-0.378	-0.108
								(-1.20)	(-0.27)
DUALITY								-0.072	-0.103
								(-1.23)	(-1.76)
CONS	-0.691***	-0.665**	-0.666**	-0.720***	0.021	-0.584**	-0.944***	-1.029**	-0.069
	(-2.98)	(-2.91)	(-2.84)	(-3.44)	(0.07)	(-2.39)	(-3.91)	(-2.95)	(-0.18)

3.4.2 Propensity to Pay Cash Dividends and Catering Theory

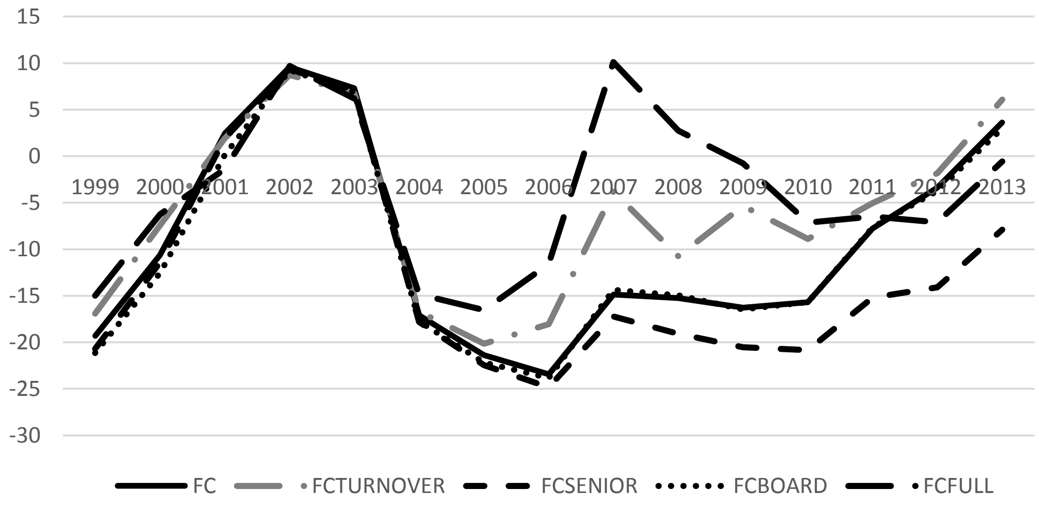
To examine the unexplained proportion of declining dividend-payers in the China, we estimate the propensity to pay (PTP_t), which is measured as the actual percentage of dividend-payers minus expected percentage of dividend-payers in year t. The expected percentage of dividend payers is computed using baseline logit regression with the basic firm characteristic and state proxies as the independent variables during the base period 1999-2003. To compare the propensity to pay after accounting for free cash flow, leverage, lifecycle, risk, liquidity, senior and board, we also estimate the expected probability using the logit regressions embedded with these control variables.

Figure 3.3: Propensity to Pay Cash Dividends, 1999-2013. Panel A reports the unadjsusted propensity to pay and propensity to pay with free cash flow, leverage, lifecycle and risk adjustments. The solid line is the propensity to pay without adjustment. It is derived from the logit model with explanatory variables of market-to-book ratio, asset growth, earnings-to-assets ratio, size percentile and state proxy. The grey dotted-dashed line is the free cash flow adjusted propensity to pay. The short-dashed line is the leverage adjusted propensity to pay. The dotted line is the lifecycle adjusted propensity to pay, the long-dashed line is the risk adjusted propensity to pay. Panel B reports the unadjsusted propensity to pay and propensity to pay with liquidity, senior, board, all control variabls adjustments. The solid line is the propensity to pay without adjustment. The grey dotted-dashed line is the liquidity adjusted propensity to pay. The short-dashed line is the senior adjusted propensity to pay. The dotted line is the board adjusted propensity to pay, the long-dashed line is the all control variables adjusted propensity to pay.

Panel A: Unadjusted PTPC and PTPC adjusted for FCF,Leverage, Lifecycle and Risk.



Panel B: Unadjusted PTPC and PTPC adjusted for Liquidity, Senior, Board and All.



Panel A of Figure 3.3 plots the propensity to pay with and without free cash flow, leverage, lifecycle, and risk adjustments for our sample period from 1999 to 2013. The solid line in the figure reveals the changes in propensity to pay when considering the expected proportion of dividend-payers using only the standard firm characteristics variables. It increases significantly from -19.30% in 1999 to 9.58% in 2002. Then a pronounced decline from 9.58% in 2002 to -23.45% in 2006 is observed in the sample period. After 2007 the unexpected portion of payers fluctuates around -15% and then reverses to 3.62% in 2013. During 2007-2009, we observe an upward trend in the propensity to pay. This shows that firms continue to pay dividends during the global financial crisis. This supports the signalling hypothesis, where firms are reluctant to cut dividend payments as they provide an indication of the financial health of the firm. Similar evidence of improved dividend payments during the financial crisis is reported by Acharya et al. (2011).

When we examine the effect of free cash flow, leverage, lifecycle and risk on the propensity to pay, we find that free cash flow, leverage and lifecycle do not explain the changes in propensity to pay. However, when the propensity to pay is adjusted for risk (dashed line), we obtain a different picture. We find that the propensity to pay decreases to the nadir of -14.44% in 2005, with a subsequent increase until 2007 and a sharp decrease during the period 2007-2009. After that, it shows significant upward trend from 2010 to 2013. Comparing the spread between the propensity to pay with and without risk adjustments, we observe that the spread has widened after 2004 and increased during period 2006-2010, suggesting that risk is an important factor in explaining the declining proportion of dividend-payers in China. This conclusion is in line with Hoberg and Prabhala (2009)'s findings for the US market and Kuo et al. (2013)'s finding for the world-wide markets.

Panel B of Figure 2 depicts the propensity to pay with and without liquidity, managerial stake, board variables and all the control variables adjustment during our sample period 1999-2013. The propensity to pay adjusted for liquidity (dashed-dotted line) shows different fluctuation with unadjusted propensity to pay. It reduces to from 8.72 in 2002 to -20.15 in 2005, then increases to -3.81 in 2007. After that, it fluctuates around -5 until 2011 and then increases to 6.08 in 2013. Compared with the unadjusted propensity to pay, the propensity to pay adjusted with turnover is much closer to the X-axis, especially after 2004, indicating that liquidity could explain portion of the movement of propensity to pay. However, even after controlling for liquidity, we still could observe the substantial downward trend from 2002-2005, suggesting that changes in dividends payment could only partly explained by liquidity. Also, it shows that both the senior and board variable could not alter the trends in the unadjusted propensity to pay. However, after incorporating all the variables, the propensity to pay moves more close to the zero axis.

Next, in order to quantitatively measure the extent to which disappearing dividends could be explained by these control variables, we adopt the three methods used by Hoberg and Prabhala (2009). The first method is the difference in difference method, where the percentage of propensity to pay explained by these control variables is measured as the difference between propensity to pay between 2004 and 2013, based on the fitted logit regressions from the 1999-2003 base period with and without these controls. The second method measures the rate of changes in dividends payment, which is defined as the difference in the slope coefficients of the regression of propensities (estimated from fitted logit regressions with and without these controls) on the time-trend. The difference in the slope coefficients captures the percentage of changes in dividend payments explained by these controls. The third method is the integrated propensity to pay, which is equal to the average propensity to pay. Under this method, the percentage of changes in dividend payments explained by these control variables is measured through the difference between the average propensities based on fitted logit regressions with and without these controls.

Table 3.8: The Propensity to Pay Cash Dividends Explained by Key Variables. Panel A reports the dividends payment changes explained by basic variables (in Row (1)), free cash flow (in Row (2)), leverage (in Row (3)), lifecycle (in Row(4)), risk (in Row (5)), liquidity (in Row (6)), senior (in Row (7)), board (in Row(8)), and both all control variables (in Row (9)) during the period 2004-2013 using three methods. Column (2) models the dividends payment changes as the propensity to pay dividends in 2013 minus the 2004 propensity. Column (3) represents dividends payment changes as the rate of decline in propensity to pay, or the estimated coefficients of the regression of the propensity on time-trend. And Column (4) represents dividends payment changes as the average propensity to pay between 2004 and 2013. Panel B reports the percentage of dividends changes explained by free cash flow (in Row (1)), leverage (in Row (2)), lifecycle (in Row(3)), risk (in Row (4)), liquidity (in Row (5)), senior (in Row (6)), board (in Row(7)), and both all control variables (in Row (8)) during the period 2004-2013 using three methods. Column (2) reports the percentage of propensity to pay explained by key variables with the difference in difference measure, which is the difference between the 2009 and 1998 propensity to pay based on the logit regressions with and without key variables controls. Column (3) presents explained percentage of propensity to pay by key variables based on the estimated coefficients of the regression of the propensity on time-trend.

Panel A: Dividends changes explained by key variables.

	Dividends changes defined as		
Explanatory Variables	Difference in Propensity	Coefficient for Trend Line	Average Propensity
M/B, AG, EA, SIZE, STATE	-13.497	-1.954	13.880
M/B, AG, EA, SIZE, STATE,FCF	-12.054	-1.925	13.475
M/B, AG, EA, SIZE, STATE,LEVERAGE	-12.513	-1.885	13.551
M/B, AG, EA, SIZE, STATE,LIFECYCLE	-14.431	-2.080	14.312
M/B, AG, EA, SIZE, STATE,RISK	-3.280	-0.978	7.535
M/B, AG, EA, SIZE, STATE,LIQUIDITY	-10.637	-1.691	9.673
M/B, AG, EA, SIZE, STATE,SENIOR	-9.916	-1.113	17.994
M/B, AG, EA, SIZE, STATE,BOARD	-14.769	-2.046	13.966
M/B, AG, EA, SIZE, STATE,ALL	-14.311	-1.401	7.785

Panel B: Percentage of dividends changes explained by key variables.

	Disappearing dividends defined as		
Explanatory Variables	Difference in Propensity	Coefficient for Trend Line	Average Propensity
M/B, AG, EA, SIZE, STATE,FCF	-0.107	-0.015	-0.029
M/B, AG, EA, SIZE, STATE,LEVERAGE	-0.073	-0.035	-0.024
M/B, AG, EA, SIZE, STATE,LIFECYCLE	0.069	0.064	0.031
M/B, AG, EA, SIZE, STATE,RISK	-0.757	-0.499	-0.457
M/B, AG, EA, SIZE, STATE,LIQUIDITY	-0.212	-0.134	-0.303
M/B, AG, EA, SIZE, STATE,SENIOR	-0.265	-0.430	0.296
M/B, AG, EA, SIZE, STATE,BOARD	0.094	0.047	0.006
M/B, AG, EA, SIZE, STATE,ALL	0.060	-0.283	-0.439

Panel A of Table 3.8 presents the results of the three methods discussed above over the sample period. Panel B of Table 3.8 shows the percentage of changes in dividends payment explained by these control variables. Rows (1)-Row (8) report the percentage of changes in dividend payments explained respectively by free cash flow, leverage, lifecycle, risk, liquidity, senior, board and all these variables using the three methods. Using the average propensity approach, we find that the risk alone is able to explain 45% of the movement in propensity to pay, liquidity alone could explain 30% of the movement in propensity to pay, while all these control variables taken together explains around 43%. This result is similar to the evidence found in the US market, where risk explains around 40% of disappearing dividends (Hoberg and Prabhala, 2009). Overall from the test results, we conclude that firm specific risk plays a much more important role than the other control variables in explaining the fluctuation in propensity to pay observed in the China, and this confirms the conclusions drawn from Figure 3.3.

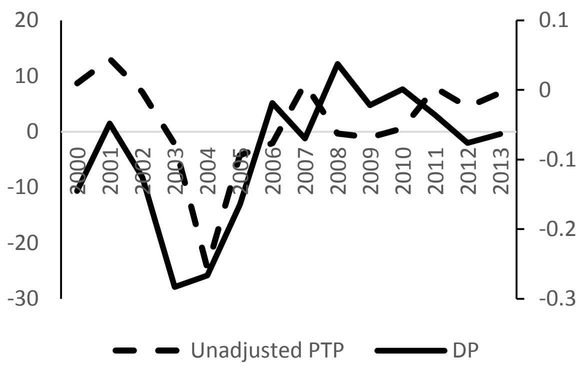
3.4.3 Catering Incentives and Propensity to Pay Cash Dividends

In this section, we examine whether catering incentives (Baker and Wurgler (2004b) can explain the disappearing dividend puzzle in the China. According to the catering hypothesis, market prices of dividend-paying firms and non-dividend-paying firms with similar characteristics are driven by investor sentiment. If investors place a premium (or a discount) on dividend-payers relative to non-payers according to their preference for dividends, this premium (or discount) will incentivise firms to cater to the prevailing demand by altering their dividend policy. This suggests that Moreover, the change in dividend payment policy caused by investment sentiment and not related to firm characteristics. Thus, the change in the unexpected proportion of dividend-payers is suggested to be positively related to the premium (discount) at the beginning of the period. To capture the changes in the propensity to pay due firms' response to investor preferences, Baker and Wurgler (2004b) define several proxies for the catering incentives (premium or discount). The most widely used proxy is the dividend premium, which measures the differences in the market values of dividend-payers and non-dividend-payers and is defined as the difference between log of the value-weighted market-to-book ratio for dividend-payers and non-dividend-payers. Baker and Wurgler's (2004a) research suggests that the dividend premium can substantially explain the changes in propensity to pay in the US market during 1963-2000.

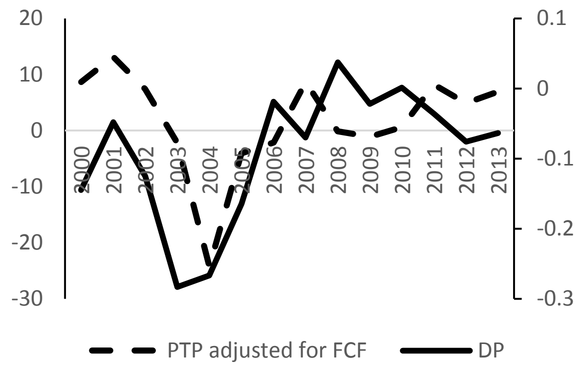
In Figure 3.4 we visually depict whether dividend premium (capturing catering incentives) in year t-1 can predict the changes in the propensity to pay for a firm in year t. Figure 3 (A) plots the lagged dividend premium and the annual changes in the unadjusted propensity to pay over our sample period. We see that the movements of the two series exhibit a high degree of consistency. This indicates that dividend premium does influence the dividend decision made by firms. Overall a similar picture emerges when adjusting changes in the propensity to pay for free cash flow in Figure 3 (B), for leverage in Figure 3(C), for lifecycle in Figure 3(D), for senior in Figure 3(G) and for board in Figure 3(H). However, risk adjusted changes in the propensity to pay in Figure 3 (E) presents a different picture. We see the relationship between lagged dividend premium and the changes in the propensity to pay has weakened considerably after adjusting for risk. Meanwhile, Figure 3(F) shows that the high degree of consistency between the changes in propensity to pay and lagged dividend premium disappears once we adjust the propensity to pay with liquidity. In Figure 3(I), the movements of all variables controlled changes in propensity present pronounced difference with that of the lagged dividend premium. Hence, a visual conclusion we can draw is that the catering hypothesis is weakened once changes in the propensity to pay are adjusted for the risk and liquidity elements in dividend policy.

Figure 3.4: Lagged Cash Dividend Premium and Changes in Propensity to Pay Cash Dividends with and without Adjustments, 2000-2013. Figure (A) illustrates the relationship between dividend premium (one lagged, the solid line) and the changes in propensity to pay dividends (the dashed line) when unadjusted for key variables. Figures (B) – (I) plot the lagged dividend premium and the adjusted changes in propensity to pay derived from logit regressions adjusted for free cash flow, leverage, lifecycle, risk, liquidity, senior, board and all control variables respectively.

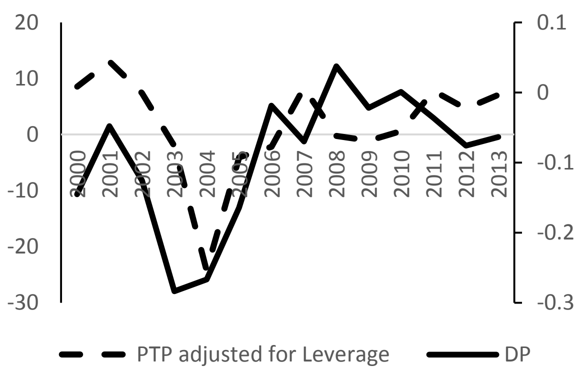
(A)



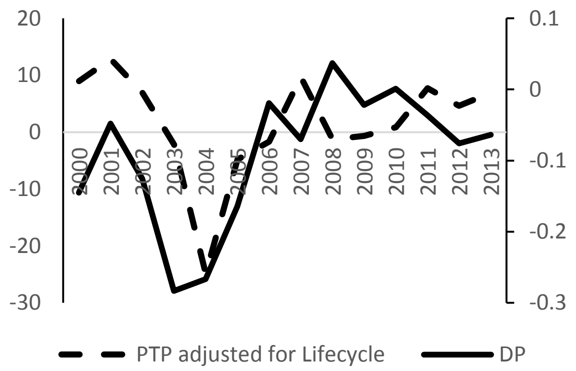
(B)



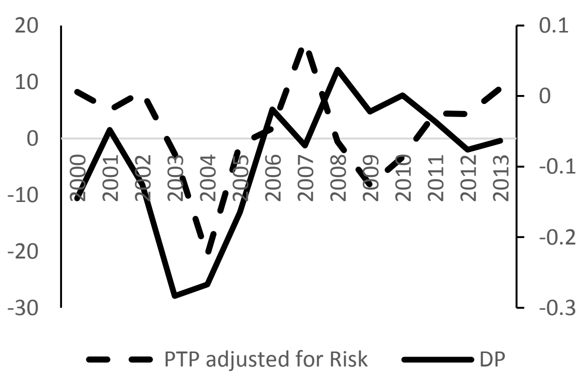
(C)



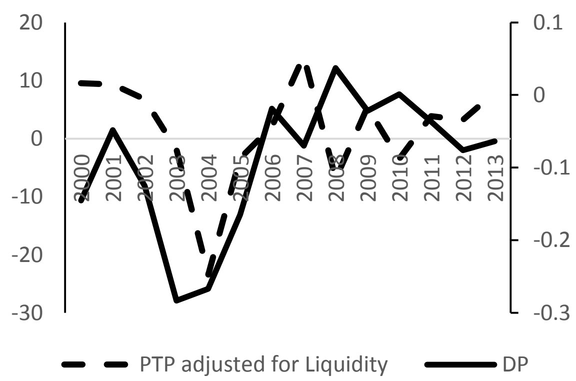
(D)



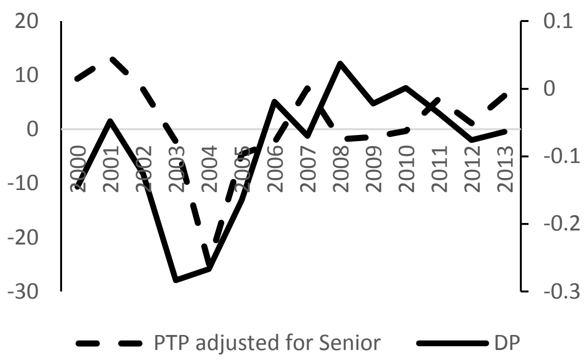
(E)



(F)



(G)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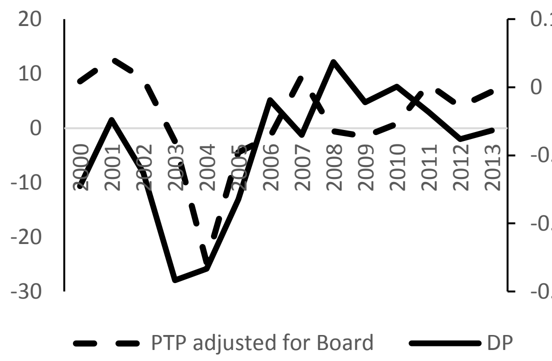
(H)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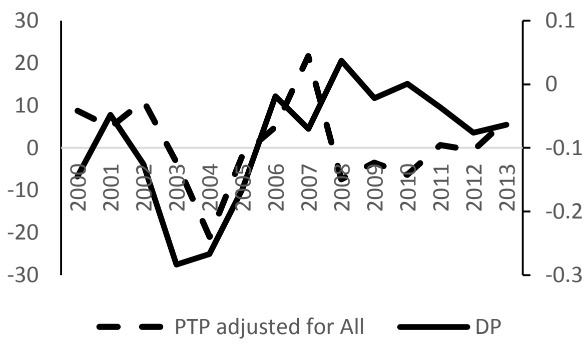
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Table 3.9: Test of catering Incentives in Explaining Changes in Propensity to Pay Cash Dividends, 2004 -2013. This table reports the estimates of the time-series regression during 1998-2009 (Equation 2) with the explanatory variables including lagged dividend premium (Catering), and 2007-09 financial crisis dummy. The dependent variable is the change in propensity to pay, which is the difference between propensity to pay in year *t* and that in year *t-1*. The propensity to pay (PTP) is the difference between actual and predicted percentage of dividend-payers, the latter is calculated with mean estimates of annual logit regressions for the base period 1999-2003 (The explanatory variables in the logit regression are reported in the Column "Logit regression variables"). The numbers in parentheses are the Newey-West adjusted t-statistics. The last column reports the adjusted r-square. *** indicates significance at 1%, ** indicates significance at 5%, * indicates significance at 10%.

		Dependent Variable=Change in Propensity to Pay Cash Dividends			
Row	**Logit Regression Variables**	**Catering**	**FC**	**Cons**	**Adj. R^2**
(A)	M/B, AG, EA, SIZE, STATE	76.126**		4.807	0.431
		(2.33)		(1.63)	
	M/B, AG, EA, SIZE, STATE	79.805*	-1.733	5.577	0.358
		(2.16)	(-0.27)	(1.49)	
(B)	M/B, AG, EA, SIZE, STATE, FCF	75.623**		4.885	0.424
		(2.31)		(1.65)	
	M/B, AG, EA, SIZE, STATE, FCF	79.388*	-1.773	5.673	0.350
		(2.14)	(-0.28)	(1.49)	
(C)	M/B, AG, EA, SIZE, STATE, Leverage	75.363**		4.779	0.430
		(2.32)		(1.64)	
	M/B, AG, EA, SIZE, STATE, Leverage	79.262*	-1.836	5.595	0.358
		(2.16)	(-0.29)	(1.49)	
(D)	M/B, AG, EA, SIZE, STATE, Lifecycle	77.473*		4.921	0.421
		(2.29)		(1.58)	
	M/B, AG, EA, SIZE, STATE, Lifecycle	80.795*	-1.565	5.617	0.345
		(2.13)	(-0.23)	(1.52)	
(E)	M/B, AG, EA, SIZE, STATE, Risk	53.311		3.900	0.117
		(1.44)		(1.07)	
	M/B, AG, EA, SIZE, STATE, Risk	53.659	-0.164	3.973	-0.010
		(1.21)	(-0.02)	(1.00)	
(F)	M/B, AG, EA, SIZE, STATE, Liquidity	63.597		4.260	0.213
		(1.51)		(1.05)	
	M/B, AG, EA, SIZE, STATE, Liquidity	59.541	1.910	3.412	0.109
		(1.28)	(0.23)	(0.85)	
(G)	M/B, AG, EA, SIZE, STATE, Senior	73.647*		3.511	0.441
		(2.30)		(1.25)	
	M/B, AG, EA, SIZE, STATE, Senior	76.265*	-1.233	4.059	0.365
		(2.12)	(-0.20)	(1.21)	
(H)	M/B, AG, EA, SIZE, STATE, Board	76.825**		4.835	0.427
		(2.34)		(1.61)	
	M/B, AG, EA, SIZE, STATE, Board	80.308*	-1.640	5.564	0.353
		(2.16)	(-0.24)	(1.52)	
(I)	M/B, AG, EA, SIZE, STATE, All	45.804		2.443	0.028
		(1.09)		(0.57)	
	M/B, AG, EA, SIZE, STATE, All	38.666	3.361	0.949	-0.087
		(0.75)	(0.30)	(0.22)	

We statistically test for the presence of catering hypothesis by regressing the changes in propensity to pay cash dividends with equation (3). Table 3.9 presents the results of regression Equation (2) for the sample period 2004-2013 and is organized in eight panels. Panel A reports the estimates of the regression where the propensity to pay is based on the fitted logit regression, with Fama and French (2001)'s firm characteristics and state variables as independent variables. Panel B- Panel H present the regression results where the above propensity to pay is adjusted for free cash flow, leverage, lifecycle, risk, liquidity, senior, and board respectively. Panel I presents the estimation of the regression with all control variables adjusted propensity. The results in Panel A indicate that before adjusting for these control variables, catering incentive has a significantly positive impact on the changes in the unpredicted proportion of dividend-payers.

From the results in Panel B, Panel C, Panel D, Panel G and Panel H, we find that, even after accounting for free cash flow, leverage, lifecycle, senior and board, the coefficient on catering incentives still remains significant in explaining the adjusted propensity to pay. Noticeably, it could be implied from Panel D and Panel G that lifecycle and managerial stake could weaken the significant explanatory power of catering on the changes in propensity. However, once the propensity to pay has been adjusted for risk, the results in Panel E show that catering incentives no longer explains the changes in propensity to pay. Hence we do not find evidence of firms' catering to investors' dividend preferences once we control for risk. Our results corroborate Hoberg and Prabhala (2009)'s finding in the US market and Kuo et al. (2013)'s finding in world-wide markets regarding the lack of applicability of catering theory. Meanwhile, Panel F shows that catering proxy could not significantly explain the liquidity-adjusted changes in propensity to pay, indicating that significant explanatory power of catering incentives also disappear once we control the propensity to pay for liquidity. This is different from Kuo et al. (2013)'s evidence for world-wide markets which suggested that liquidity could not eliminate the significant explanatory power of catering incentives. In Panel H, we test the significance of catering incentives after controlling for all the control variables and confirm the conclusion drawn from the previous panel that once propensity is adjusted for risk or liquidity, catering theory cannot explain the disappearing dividends puzzle in the Chinese market. Meanwhile, the insignificance of financial crisis dummy in all regressions considered indicates that there has not been a significant change in dividend payouts among Chinese firms during the 2007-2009 financial crisis.

Overall, the results show that risk and liquidity are significant in explaining the changes in propensity of dividend payments in China. Once we adjust the propensity to pay for risk or liquidity, we see that dividend premium loses its explanatory power and hence we find no support for the presence of catering incentives among Chinese firms. Further, we find that the senior and board variables could not explain the unexpected proportion in dividend payments.

3.5 Empirical Results for Stock Dividend Payouts

3.5.1 Results of the Logit Regression for Stock Dividend Payouts

For the stock dividends, we first study the determinants of stock dividend payments among Chinese firms during the sample period 1999-2013 with equation (2). Table 3.10 reports the estimates coefficients and Newey-West t-statistics for the logit regression in Equation (2) that predicts the probability of a firm being a stock-dividend-payer. Similar to Table 3.7 which reports the determinate of cash dividend payments, Table 3.10 also includes 9 columns and illustrate the logit regressions with different explanatory variables in these columns.

Table 3.10: Logit Estimation Explaining the Probability of Being a Stock-Dividend-Payer, 1999-2013. This table reports the logit regression results using Fama and MacBeth (1973) style estimation, with Newey–West t statistics reported in parentheses. The dependent variable is equal to one if the firm pays stock dividend that year and zero otherwise. The explanatory variables are market-to-book ratio (*M/B*), assets growth (*dA/A*), earnings-to-asset ratio (*E/A*), size percentile (*SIZE*), whether a firm is state owned (*STATE*), free cash flow (*FCF*), leverage ratio (*D/E*), retained earnings-to-book equity ratio (*RE/BE*), liquidity measure proxied by turnover ratio (*ToR*), systematic risk (*SYS*), idiosyncratic risk (*IDIO*), percentage of shares held by senior managers (*SEN_OWN*), number of board members (*BD_SIZE*), percentage of shares held by board members (*BD_OWN*), percentage of independent board (*IND_PER*), yearly number of board meetings (*BD_MEETING*) and whether the CEO and the chair of the board of directors are the same person (*DUALITY*). Columns (1) - (9) report the estimates of the various logit regressions with Fama and French (2001) firm characteristic variables, state owner proxy and other explanatory variables. *** indicates significance at 1%, ** indicates significance at 5%, * indicates significance at 10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
M/B	0.007	0.007	0.032	0.049	0.001	0.006	0.008	0.007	0.006
	(0.97)	(0.81)	(0.88)	(1.62)	(0.11)	(0.76)	(1.11)	(1.08)	(0.22)
dA/A	-0.156	-0.234*	-0.159	-0.059	-0.134	-0.145	-0.157	-0.143	-0.191
	(-1.26)	(-1.78)	(-1.30)	(-0.45)	(-1.17)	(-1.14)	(-1.24)	(-1.17)	(-1.29)
E/A	9.760***	10.368***	10.026***	5.635***	9.448***	9.788***	9.686***	9.793***	6.516***
	(12.31)	(12.79)	(13.36)	(7.11)	(14.50)	(12.93)	(12.22)	(11.50)	(9.09)
SIZE	1.506***	1.633***	1.496***	0.792***	1.260***	1.638***	1.552***	1.595***	0.767***
	(12.53)	(11.67)	(12.58)	(6.05)	(8.41)	(11.58)	(12.71)	(12.84)	(5.33)
STATE	-0.387***	-0.336***	-0.396***	-0.322***	-0.346***	-0.264***	-0.360***	-0.293***	-0.163*
	(-5.21)	(-4.31)	(-5.34)	(-4.17)	(-4.45)	(-3.71)	(-4.39)	(-3.54)	(-1.81)
FCF		-0.025***							-0.029***
		(-4.21)							(-4.40)
D/E			0.031						0.169***
			(1.18)						(4.00)
RE/BE				3.396***					3.698***
				(15.81)					(14.28)
SYS					-40.035*				-69.393***
					(-2.07)				(-3.58)
IDIO					3.228				-9.989
					(0.41)				(-0.81)
ToR						0.273***			0.337***
						(7.59)			(6.92)
SEN_OWN							0.430		2.334*
							(1.19)		(2.04)
BD_SIZE								-0.046**	-0.028
								(-2.21)	(-1.14)
BD_OWN								-0.204	-1.851
								(-0.52)	(-1.48)
BD_MEETING								0.021**	0.019*
								(2.18)	(1.86)
IND_PER								-1.304*	-0.878
								(-1.86)	(-1.52)
DUALITY								-0.023	-0.193
								(-0.18)	(-1.50)
CONS	-4.119***	-4.214***	-4.152***	-4.615***	-3.527***	-4.778***	-4.194***	-3.613***	-3.886***
	(-23.69)	(-22.97)	(-23.14)	(-24.81)	(-9.54)	(-21.27)	(-23.02)	(-12.65)	(-7.86)

The results in Column (1) shows that profitability and size proxies are positive related with the probability of being a stock dividend payer. This implies that larger firms with more profitability are more likely to pay stock dividend. The result is consistent with the signaling hypothesis that more profitable firms are more likely to pay stock dividend to signal favorable information. Also, the result support Elgers and Murray (1985)'s political costs theory. However, the investment opportunity proxies including market-to-book ratio and asset growth ratio is not significantly related to stock dividend payments in China over our sample period.

Column (1) of Table 3.10 suggests that controlling blockownership by government institutions is negatively and significantly related with the probability of being a stock dividend payer. This in line with Wei and Xiao (2009)'s finding that state ownership is negatively related with stock dividend payments. Columns (2)-(5) presents the results when the free cash flow, leverage ratio, earned-to-contributed equity mix and risk are added to the baseline models. It shows that free cash flow has a negative and statistically significant coefficient with the probability of being a stock dividend payer. This is in line with the cash substitution theory that firms with deterioration in cash flow would choose stock dividend payouts. Also, the result suggests a significant and positive association between lifecycle and stock dividend payments. This is consistent with implication of Grinblatt et al.'s (1984) retained earnings hypothesis that firms with higher lifecycle proxy are likely to pay stock dividends. Column (5) of Table 3.10 shows that systematic risk is significantly negatively related with stock distribution. This indicates that risk could negatively influence the stock dividend payments.

The logit model used in Column (6) is designed to test the impact of liquidity on the stock distribution when the effect of firms' characteristic variables and state shares are controlled for. It shows that the estimated coefficient on stock turnover is positive and statistically significant. Furthermore, for our sample period considered, the inclusion of the liquidity variable does not affect the significance of the standard those firm characteristics variables and the state ownership proxy, indicating that firm characteristics, state proxy and liquidity are important variables in explaining stock distribution in China. Our result support the price range theory that more liquid firms are more likely to pay stock dividend to bring their share prices into preferred range.

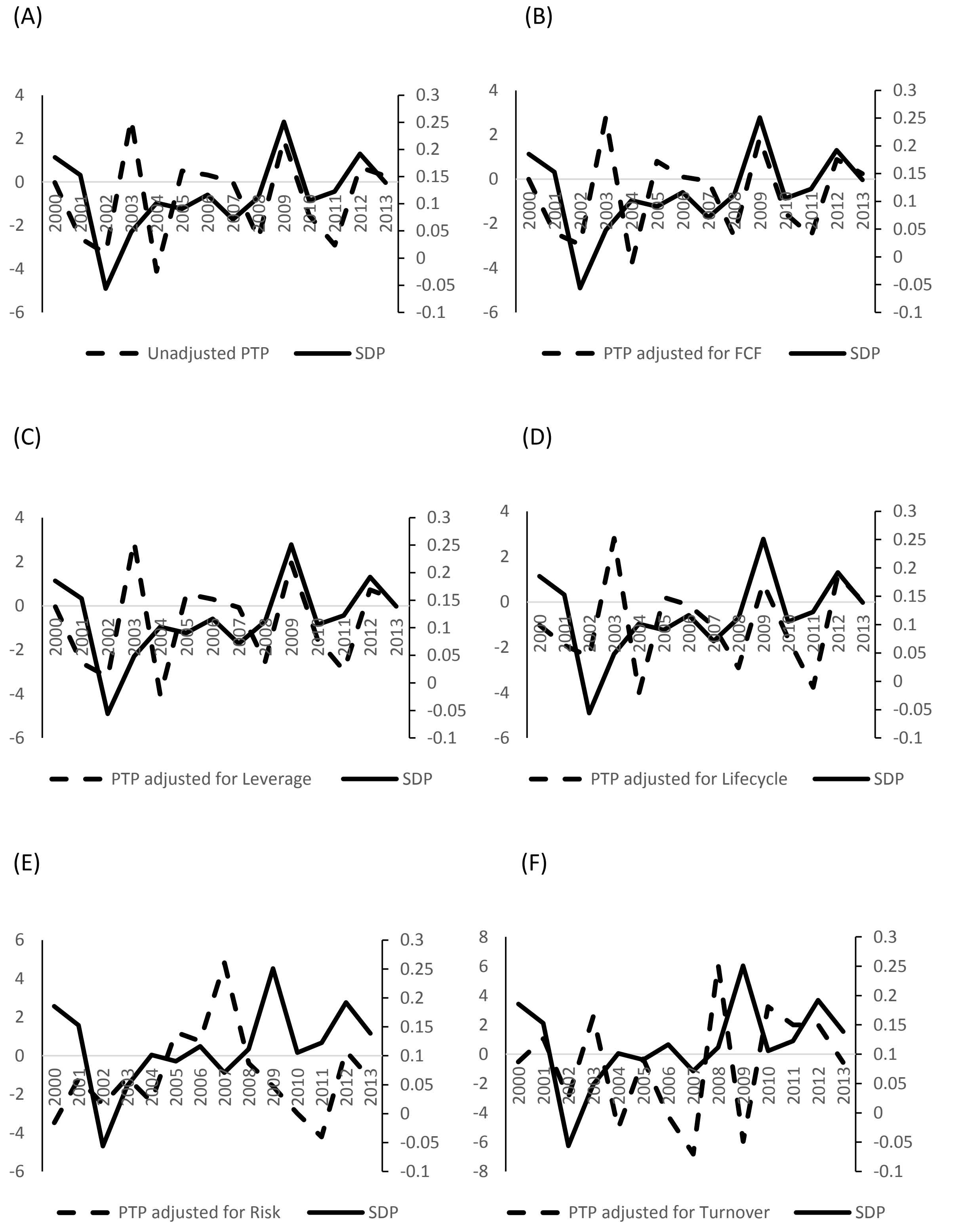
Column (7) and Column (8) report the relation between corporate governance and stock distribution. Column (7) shows that ownership of senior managers is not related with stock dividend payments. This indicates that managers could not significantly influence the stock distribution. Meanwhile, Column (8) of Table 3.10 shows that board size and percentage of independent board are negatively and significantly associated with the probability of being a stock dividend payer. This implies that, firms with better corporate governance are less likely to pay stock dividend as stock distribution could not increase firms' value. Also, the result shows that number of annual board meetings could positively and significantly impact stock dividend payments.

In Column (9) of Table 3.10, we include state control proxy, free cash flow, leverage, lifecycle, risk, liquidity, senior variable and board variables along with the baseline variables and find that state proxy, free cash flow, lifecycle, risk, liquidity and board variables still hold significant explanatory power in the sample period considered, even after including firm characteristic variables. Thus, state proxy, free cash flow, lifecycle, risk, liquidity, board and firms characteristic variables are important determinants of stock dividend payouts among Chinese firms over our sample period. However, the statistical significance of board size and board independence disappears. Only board meeting frequency stays significant. Also, the managerial stake becomes significant in explaining the stock dividend payouts. These changes may be caused by the higher correlation between managerial ownership and board characteristics.

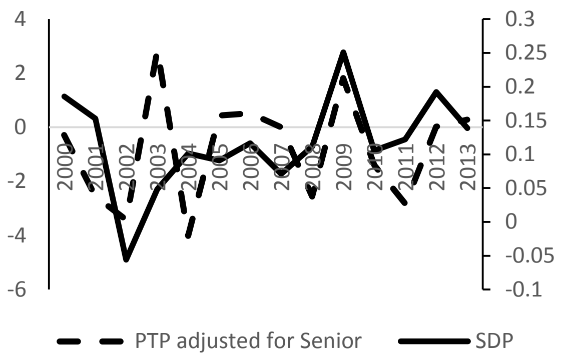
3.5.2 Catering Incentives and Propensity to Pay Stock Dividends

Further, we consider whether catering incentives affect the propensity to pay stock dividends by testing whether the unexpected proportion of stock dividend payments might be explained by a stock dividend premium. Figure 3.5 illustrates the patterns of the stock dividend premium and changes in the propensity to pay stock dividend. The propensity to pay stock dividend is measured as the actual percentage of stock-dividend-payers minus expected percentage of stock-dividend-payers in year t. The expected percentage of dividend payers is computed using baseline logit regression with the basic firm characteristic and state proxies as the independent variables during the base period 1999-2003. We also estimate the expected probability while free cash flow, leverage, lifecycle, risk, liquidity, senior and board are controlled for Figure 3.5(A) shows that the movements of stock dividend premium and changes in propensity to pay shows high degree of consistency. Even after adjusting the propensity for free cash flow, leverage, lifecycle, senior or board variables, the two lines still exhibit high degree of consistency. However, once the propensity to pay stock dividend is adjusted for risk or liquidity, the close relation between the two lines is weakened. Figure 3.5(I) depicts the lagged stock dividend premium and the changes in the propensity with the adjustment of all the control variables. The two lines in Figure 3.5(I) shows different trends over the sample period.

Figure 3.5: Lagged Stock Dividend Premium and Changes in Propensity to Pay Stock Dividends with and without Adjustment, 2000-2013. Figure (A) illustrates the relationship between stock dividend premium (one lagged, the solid line) and the changes in propensity to pay dividends (the dashed line) when unadjusted for key variables. Figures (B) – (I) plot the lagged stock dividend premium and the adjusted changes in propensity to pay derived from logit regressions adjusted for free cash flow, leverage, lifecycle, risk, liquidity, senior, board and all control variables respectively.



(G)



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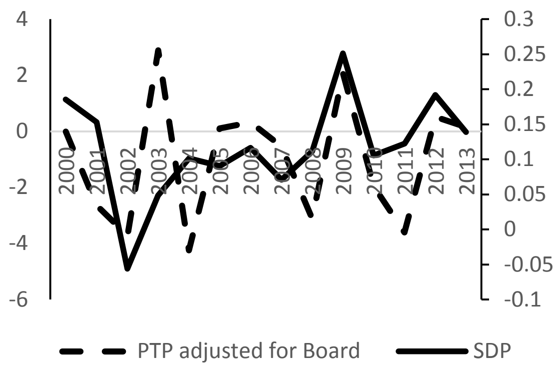

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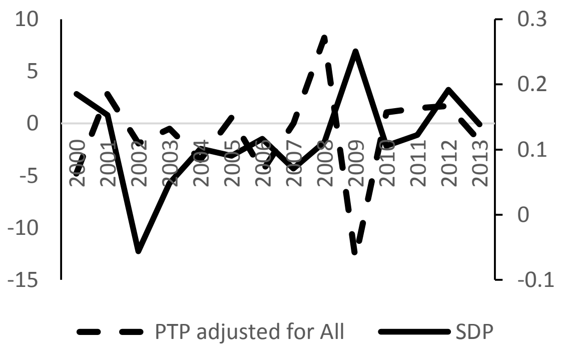

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Table 3.11: Test of Catering Incentives in Explaining the Changes in Propensity to Pay Stock Dividends, 2004-2013. This table reports the estimates of the time-series regression during 1998-2009 (Equation 2) with the explanatory variables including lagged stock dividend premium (Catering), and 2007-09 financial crisis dummy. The dependent variable is the change in propensity to pay, which is the difference between propensity to pay in year *t* and that in year *t-1*. The propensity to pay (PTP) is the difference between actual and predicted percentage of stock-dividend-payers, the latter is calculated with mean estimates of annual logit regressions for the base period 1999-2003 (The explanatory variables in the logit regression are reported in the Column "Logit regression variables"). The numbers in parentheses are the Newey-West adjusted t-statistics. The last column reports the adjusted r-square. *** indicates significance at 1%, ** indicates significance at 5%, * indicates significance at 10%.

	Dependent variable=change in propensity to pay stock dividends				
Row	**Logit Regression Variables**	**Catering**	**FC**	**Cons**	**Adj. R^2**
(A)	M/B, AG, EA, SIZE, STATE	18.795**		-3.185*	0.176
		(2.52)		(-2.20)	
	M/B, AG, EA, SIZE, STATE	18.155*	0.377	-3.215*	0.070
		(2.28)	(0.30)	(-2.19)	
(B)	M/B, AG, EA, SIZE, STATE, FCF	18.273**		-3.049*	0.187
		(2.57)		(-2.20)	
	M/B, AG, EA, SIZE, STATE, FCF	17.918*	0.210	-3.066*	0.074
		(2.29)	(0.17)	(-2.13)	
(C)	M/B, AG, EA, SIZE, STATE, Leverage	18.981**		-3.207*	0.185
		(2.61)		(-2.26)	
	M/B, AG, EA, SIZE, STATE, Leverage	18.392**	0.348	-3.235*	0.078
		(2.37)	(0.28)	(-2.23)	
(D)	M/B, AG, EA, SIZE, STATE, Lifecycle	18.276**		-3.502**	0.176
		(2.74)		(-2.80)	
	M/B, AG, EA, SIZE, STATE, Lifecycle	18.749**	-0.280	-3.479**	0.065
		(2.46)	(-0.25)	(-2.55)	
(E)	M/B, AG, EA, SIZE, STATE, Risk	-13.628		1.203	-0.034
		(-0.98)		(0.49)	
	M/B, AG, EA, SIZE, STATE, Risk	-17.930	2.539	1.001	0.106
		(-1.28)	(1.43)	(0.54)	
(F)	M/B, AG, EA, SIZE, STATE, Liquidity	-7.487		0.021	-0.116
		(-0.25)		(0.00)	
	M/B, AG, EA, SIZE, STATE, Liquidity	-4.612	-1.697	0.156	-0.232
		(-0.16)	(-0.37)	(0.04)	
(H)	M/B, AG, EA, SIZE, STATE, Senior	16.354*		-2.903*	0.127
		(2.19)		(-2.06)	
	M/B, AG, EA, SIZE, STATE, Senior	15.626*	0.429	-2.937*	0.019
		(2.09)	(0.35)	(-2.08)	
(I)	M/B, AG, EA, SIZE, STATE, Board	21.877**		-3.877**	0.230
		(3.00)		(-2.71)	
	M/B, AG, EA, SIZE, STATE, Board	21.405**	0.278	-3.899**	0.125
		(2.70)	(0.21)	(-2.65)	
(J)	M/B, AG, EA, SIZE, STATE, All	-59.675		6.802	0.257
		(-1.84)		(1.67)	
	M/B, AG, EA, SIZE, STATE, All	-60.315	0.378	6.772	0.152
		(-1.61)	(0.09)	(1.55)	

Then, we statistically test for the presence of catering hypothesis for stock dividend payouts with equation (4). Table 3.11 reports the estimated coefficients and Newey-West t-statistics for equation (4) over the sample period 2004-2013. The results in Table 3.11 are organized into eight panels. Panel A reports the estimates of the regression using changes in the unadjusted propensity as dependent variable. Panel B- Panel H present the regression results where the effects free cash flow, leverage, lifecycle, risk, liquidity, senior, and board are controlled for, respectively. Panel I presents the estimation of the regression with all control variables adjusted propensity. Panel A shows that estimated coefficient of catering incentive is positive and significant, which implies that managers choose stock dividend policy to cater investors preference for stock dividend. Panel B, Panel C, Panel D, Panel G and Panel H show that stock dividend premium could still significantly impact firms' stock dividend policy even after controlling the propensity for free cash flow, leverage, lifecycle, senior or board. However, the results in Panel E and Panel F show that the explanatory power of catering incentive disappear once we adjust the propensity with liquidity or risk. This indicates that the stock dividend premium actually captures the risk/liquidity difference between stock-dividend payers and non-stock-dividend payers. That is, the stock dividend premium, capturing investors' preference for stock dividends, actually acts as the proxy for the risk/liquidity. Panel I reports that dividend premium could not significantly influence changes the propensity to pay when the propensity is adjusted with all the control variables.

3.6 Conclusion

This paper examines the cash/stock dividend payment patterns in China over the sample period 1999-2013 to explore the determinants of Chinese firms' cash/stock dividend payout policies. First, we study cash dividend payout pattern and observe significant decline in the percentage of cash dividend payers from 2002 to 2006 and a recovery after that. We use logit regression to test the determinants of being a dividend payer. The results show that, in line with Fama and French (2001), larger and more profitable firms with less investment opportunities are more likely to pay cash dividend. Moreover, we also find evidence that lifecycle theory (DeAngelo et al., 2004) appears to be applicable as its proxy appears to be positively related to the probability of being a dividend payer. Further, cash dividend payment is negatively related with risk and stock liquidity. Further, we find that managers could not determine firms' cash dividend payments, while board could influence firms' cash dividend payouts.

Then we test catering theory for cash dividend payments. It shows that catering incentive is positive associated with the changes in the unadjusted propensity to pay cash dividends, even after controlling the financial crisis dummy. This indicates that managers choose the cash dividend payment policy to cater to investors' preference for dividends. Further, when we adjusted the propensity with free cash flow, leverage, senior or board proxy, catering incentive is still significantly and positively related with unexpected cash dividend payouts. However, the significantly explanatory power of dividend premium disappear once we control the propensity for liquidity or risk. This means that the catering incentive actually measures the difference in firms' liquidity or risk between cash-dividend payers and non-cash-dividend payers.

Furthermore, this paper considers the stock dividend payment pattern in China. The percentage of stock-dividend payers in China decreased dramatically from 13.82% in 1999 to 2.36% in 2013. We use a logit model to explore the determinants of being a stock dividend payer. The results indicate that larger firms with more profitability are more likely to pay stock dividend. Also, state-owned enterprises are less likely to pay stock dividend, this is consistent with Cheng et al. (2009)'s dividend preference theory. Meanwhile, we find that stock dividend payouts are negatively associated with free cash flow and positively related with lifecycle proxy. Further, it shows that risk could negatively impact the probability of being a stock dividend payer, while liquidity measured by turnover could positively influence stock dividend payments in China over our sample period. In addition, senior managers could not affect firms' stock dividend payments, and firms with better corporate governance are less likely to pay stock dividend.

Finally, we test the catering theory for stock dividend payouts in China. The results illustrate that dividend premium matters for the changes in unadjusted propensity, and the propensity adjusted for free cash flow, leverage, lifecycle, senior and board. However, once we controlled the propensity with liquidity or risk, the catering incentive is insignificant and contribute little toward explaining the changes in propensity to pay stock dividend. This implies that stock dividend premium captures the different characteristics (risk and liquidity) of the firms. That is, stock dividend premium matters only if we do not control for liquidity or risk.

Chapter 4 Illiquidity, Variance Risk Premium and Stock Market Returns

Previous studies show that market liquidity risk and volatility risk are essential indicators of expected excess stock returns. However, it is still unclear whether these risk factors trigger the stock returns. This study comprehensively investigates the interplay among illiquidity, variance risk premium, and stock returns using monthly US data from January 1992 to December 2010. We find that the variance risk premium reflecting investors' risk aversion to volatility risk causes variations in stock returns, and in turn causes market illiquidity, rather than vice versa. Our results further show that the variance risk premium has a strong predictive power for excess stock market returns, while illiquidity does not. Finally, we find that the variance risk premium affects equity returns by acting on the systematic risk factors, namely market risk premium, value factor and momentum factor.

Chapter 4 Illiquidity, Variance Risk Premium and Stock Market Returns

4.1 Introduction

Market risk plays a prominent role in modern financial theory and is closely related to future stock returns (Merton, 1973). A growing literature shows that volatility risk and (il)liquidity risk have strong predictive power for future excess stock returns. However, it is still unclear whether these risk factors trigger the stock returns. In this paper, we test the association among volatility risk, liquidity risk, and stock market return, and examine how these risk factors affect the equity returns.

Most previous studies use realized volatility or implied volatility (e.g. VIX for the US market) as the market risk measure. In contrast, we employ a newly developed measure of variance risk premium, which is defined as the difference between implied volatility and realized volatility, so that it contains information on both conventional risk measures and also reflects exclusive information of investors' risk aversion to the volatility risk (see Bakshi and Madan (2006) and Bollerslev, Gibson, and Zhou (2011) for details). Bollerslev, Tauchen, and Zhou (2009) and Drechsler and Yaron (2011) investigate the variance risk premium for the US stock market, and find that it has strong predictive power at monthly and quarterly horizons. Bollerslev, Marrone, Xu, and Zhou (2013) extend the study of the predictive power of variance risk premium to the international stock markets, and show similar evidence as for the US market.

Jones (2002) and Lesmond, Ogden, and Trzcinka (1999) document that liquidity can predict future stock market returns. However, if we step back from the traditional view on the return-liquidity relation, causality may not, or may not only, run from liquidity to the stock return. A number of papers find that past stock returns can affect future market liquidity. For example, Chordia, Subrahmanyam, and Anshuman (2001) document that stock market returns are able to forecast future market liquidity rather than vice versa for the US market. Similarly, with a large sample of data across 46 countries, Griffin, Nardari, and Stulz (2004) show international evidence that liquidity follows the past returns.

If return can impact the future market liquidity, then the variance risk premium may also do so. Failure to recognize that liquidity is the causal variable may cause misjudgements in the interplay among liquidity, stock return, and variance risk premium. Also, if liquidity responds to past returns or past variance risk premium then it makes sense to include these variables to supplement any forecasting tests of liquidity. Doing so is likely to avoid overestimating the true forecasting power of liquidity. Unlike previous studies, which mainly focus on the determinant role of the variance risk premium and liquidity, this paper aims to comprehensively test the interplay among variance risk premium, illiquidity, and stock returns for the US market over the period extending from January 1992 to December 2010.

We first investigate whether past liquidity can cause stock market return, or whether past stock market return can affect market liquidity. Amihud (2002) and other related papers have shown that excess stock return also reflects compensation for market illiquidity.[20] However, if we step away from the traditional view on the liquidity-return relation, and ask how the liquidity might be generated, it is quite natural to expect that return could affect future liquidity. This is empirically confirmed by Chordia et al. (2001) using daily data, and by Griffin et al. (2004) using weekly data. Thus, there is mixed

[20] Amihud et al. (2005) provide a good review of the development of illiquidity theory.

evidence as to the return-liquidity relation, and to date there is no generally agreed upon explanation for it, nor has it been subject to a comprehensive examination. Also, Amihud (2002) illiquidity ratio, which captures the price impact dimension of liquidity, has not been used to test the relation between past return and liquidity. Hence, this paper adopts Amihud (2002) illiquidity ratio as the liquidity measure and employs a large sample of monthly US data over the period 1992-2010. We comprehensively investigate the direction and magnitude of the return-liquidity relation using the Granger-causality test and impulse function. We find that illiquidity does not cause stock returns, while stock returns can cause illiquidity. This result is further confirmed by the impulse response test, as there is no evidence that stock returns respond to changes in market illiquidity. Our results imply that the liquidity, measured by the illiquidity ratio, follows the past stock market return rather than vice versa for the US market over the period 1992-2010. This indicates that research that seeks to exploit the potential impact of liquidity is unlikely to be successful for returns forecasting. Moreover, it implies that we should include the stock market return to supplement the forecasting test of liquidity.

This paper also tests the relation between variance risk premium and stock market return, and between variance risk premium and illiquidity. To the best of our knowledge, this is the first study that examines the relationship between variance risk premium and illiquidity. If illiquidity responds to the stock market return, then it is also possible that illiquidity responds to the variance risk premium. Our empirical results show that the variance risk premium can cause stock returns and illiquidity, rather than vice versa. This finding is robust for different sub-samples. The result indicates that we should add the variance risk premium in the forecasting tests of liquidity. Furthermore, the result clarifies the interplay among illiquidity, stock returns and variance risk premium: variance risk premium affects the stock market return and illiquidity, and stock market return affects liquidity. Thus the traditional view that illiquidity predicts future stock returns may be simply serendipitous. Since variance risk premium, measuring investors’ risk aversion to volatility risk, affects stock market return and then illiquidity, illiquidity contains information about the variance risk premium and thus indirectly impacts the stock market return.

This study also tests the forecasting power of the variance risk premium and illiquidity for excess stock market returns. Our results show that the variance risk premium, rather than illiquidity, can significantly enhance the predictive power of the benchmark model. That is, the variance risk premium rather than the illiquidity contains useful information for forecasting future stock market returns. Moreover, we study the impulse response functions of illiquidity, stock returns, and the variance risk premium for a period of 24 months. We find that there is no impulse response for stock returns to illiquidity, while the variance risk premium significantly affects the stock market returns in the long term. In the short run, stock returns and most variance risk premium measures can significantly affect illiquidity. However, it is intriguing that the impulse responses of the variance risk premium to both the stock market returns and illiquidity cannot be observed.

Finally, in the robustness test, we study how the variance risk premium/illiquidity are related to the US equities returns, by investigating the relation between the variance risk premium/illiquidity and the risk factors, specifically the Fama-French three factors and the momentum factor. The Granger-causality investigation shows that the variance risk premium causes the market risk premium, value factor and momentum factor. In other words, the variance risk premium affects the equity returns via these systematic risk factors. The test for the Granger-causality relation between illiquidity and systematic risk factors shows that market illiquidity cannot cause movement in the four risk factors, but the market risk premium and momentum do cause variations in illiquidity.

This chapter proceeds as follows. Section 4.2 provides models and the literature review. Section 4.3 presents data and summary statistics. Section 4.4 shows our empirical results. Section 4.5 carries out a robustness check. Finally, Section 4.6 summarizes our conclusions.

4.2 Literature Review

4.2.1 Variance Risk Premium (VRP)

4.2.1.1 Variance Risk Premium and Predictability for Returns

The variance risk premium is defined as the difference between the variance under risk-neutral probability and that under the physical probability:

$$VRP_t = E_t^Q(Var_{t,t+1}) - E_t^P(Var_{t,t+1}) \tag{1}$$

where Q and P represent the risk-neutral and physical probability measures, respectively, and $E(\cdot)$ is the expectation operator. Variance risk premium reflects the investors' risk aversion to the market volatility risk (Bakshi & Madan, 2006; Bollerslev et al., 2009; Rosenberg & Engle, 2002). Bollerslev et al. (2009) and Drechsler and Yaron (2011) show that this premium is induced by the uncertainty of consumption related to macroeconomic uncertainty through a recursive utility framework.

The classical intertemporal CAPM model of Drechsler and Yaron (2011) demonstrates that the aggregate equity risk premium is determined by the uncertainty of underlying returns, quantified by the return variance. When holding the market portfolio, however, an investor is also bearing the uncertainty of the variance itself (Drechsler & Yaron, 2011). Just as the equity risk premium demanded by investors is a result of fear of the uncertainty of future returns, so variance risk premium is required to compensate for the uncertain variance. Theoretically, Bollerslev et al. (2009) propose that the variance risk premium effectively isolates the factor associated with the volatility of consumption growth volatility, and as a result, it should serve as an especially useful predictor for the returns over horizons for which that risk factor is relatively more important. Also, Drechsler and Yaron (2011) argue that the variance risk premium is especially relevant for unravelling the connections among uncertainty, the dynamics of the economy, preferences, and prices, and they derive conditions under which it predicts future stock returns. In addition, since the variance risk premium is required by investors for bearing the volatility risk, many papers directly extract the risk aversion from the variance risk premium (Bakshi & Madan, 2006; Bollerslev et al., 2009).

There is a close relation between the variance risk premium and the risk aversion of representative agent. Bakshi and Madan (2006) show that the variance risk premium is determined by the higher moments of stock return distribution and the degree of risk aversion. Assuming a stochastic volatility process for stock returns, Bollerslev et al. (2011) find that the variance risk premium is related to the risk aversion. Under the general equilibrium framework, Drechsler (2013) shows that the variance risk premium is sensitive to the representative agent's risk preference, which comprises the risk aversion and model uncertainty aversion.

The forecast of stock return is implemented by regressing excess stock returns on certain predictors, and the predictability is tested by the coefficients of regression slope. If the estimates are statistically significant, then the excess stock returns may be predictable and partially explained by these predictors. In a traditional dividend growth model, price-dividend ratio is the discounted value of future stock returns. Campbell (1991) and Cochrane (1992) point out that dividend yield can predict excess stock returns. Campbell and Yogo (2006) use the logarithm of dividend price ratio, logarithm of earning price ratio, short-term interest rate and term spread as predictors. Following their studies, in this paper, we consider dividend yield, P/E ratio and short-term interest rate as predictors.

The multi-period return regression takes the following form:

$$\frac{1}{h}\sum_{i=1}^{h} exr_{t+i} = b_0(h) + b_1(h)VRP_t + \varepsilon_{t+h,t} \quad (2)$$

In this regression, variance risk premium could be used to predict monthly (when h = 1), quarterly (when h = 3) and yearly (when h = 12) future return (scaled by horizon h). Naturally, we obtain the slope coefficients $b1$ (h) and $b2$ (h) as functions of horizon h. According to the theoretical model of Bollerslev et al. (2009), the model implied slope coefficient of variance risk premium regressed on h months ahead future return shows a monotonically decreasing pattern, whereas the model implied R^2 displays a humped shape, where the peaks are around the quarterly horizon. Furthermore, Drechsler and Yaron (2011) extend the long-run risks model proposed by Bansal and Yaron (2004) to capture the time variation and predictive power of variance premium. Both studies support the argument that the predictive power of variance premium is strong at short horizons (in months), which is contrary to traditional long-horizon predictors.

However, in the empirical research, differences arise owing to the various measures of variance risk premium. Both terms are unobservable, and we have to choose their empirical counterparts. For the US market, the literature usually uses the VIX index (constructed through model-free implied volatility approach) as the measure of $E_t^Q\left(Var_{t,t+1}\right)$, which is observable at time t in the US. However, the literature diverges on the choice of measure for expected realized volatility. For example, Bollerslev et al. (2009) use the ex post realized return variation over [t-1, t] time interval, which is the lagged realized variance over [t, t+1]. The method is valid under the assumption that realized volatility is a martingale process. Under this assumption, the realized volatility would behave like a unit root process with the first order autocorrelation coefficient almost equal to one, which is usually not true in practice. Empirically, Bollerslev et al. (2009) find that the estimated slope coefficient of variance risk premium is significant in time horizons of less than or equal to six months and the R^2 shows a humped shaped pattern.

Zhou (2010) considers lagged RV, ex post RV, 12-month moving average, recursive AR(12) forecast and full sample AR(12) forecast. In his empirical analysis, he mainly focuses on the method using the twelve lag auto-regressive estimates. However, when using this forecast instead of lagged realized variance, the predictive power of variance risk premium over one or two month horizon disappears.

Drechsler and Yaron (2011) consider the high frequency S&P 500 futures realized variance forecasts by projecting futures realized variance on lagged VIX and index realized variance. Their slope coefficient estimates are statistically significant and large, which is consistent with the results of Bollerslev et al. (2009).

In another related paper, following the usual practice in the variance swap market, Carr and Wu (2009) use ex post forward realized variance from daily price as the measure of expected realized variance. Although they do not directly consider an asset return predictability regression in their paper, they demonstrate a highly significant negative relationship between log difference of realized variance and implied variance (which is the opposite of the variance premium used above), and future excess return for the stock index and many of the individual stocks considered on a monthly basis.

4.2.1.2 Realized Volatility

The daily realized variance, RV, of market returns is traditionally measured by the squared (absolute) daily index returns, where the market return is defined as the natural logarithm of the ratio of consecutive daily closing index levels. Andersen and Bollerslev (1998) and 1998b) indicate that these traditional measures are poor estimators of day-by-day movements in volatility, as the idiosyncratic component of daily returns is large. They demonstrate that the realized volatility measures based on intraday data provide a dramatic reduction in noise and a radical improvement in temporal stability relative to realized volatility measures based on daily returns. Therefore, many papers suggest using high frequency intraday returns to calculate the daily realized variance. For example, Andersen, Bollerslev, Diebold, and Ebens (2001) and Areal and Taylor (2002) use the 5-minute intraday returns to calculate realized volatility, while Andersen, Bollerslev, Diebold, and Labys (2003) use 30-minute data.

This paper also adopts high-frequency intraday data. We define the daily realized variance ($\sigma_{RV}^2(t)$) for day *t* as the summation of intraday squared returns:

$$\sigma_{RV}^2(t) = \sum_{j=1}^{N} r^2(t,j) \qquad (3)$$

where *t* is the *t*-th day, which is divided into *N* sub-periods, and *r*(*t*; *j*) denotes the *j*-th intraday return in day *t*. σ_{RV} represents the realized volatility. This measure is used in several high-frequency studies, such as Zhou (1996), Taylor and Xu (1997) and Andersen et al. (2003). In application, Andersen et al. (2001) and Areal and Taylor (2002) use the summation of 79 five-minute squared intraday returns to calculate realized volatility, while Andersen et al. (2003) use 30-minute data. Andersen, Bollerslev, Diebold, and Labys (2000), Ebens (1999) and Areal and Taylor (2002) also use the five-minute returns. Following the literature, we employ the five-minute high frequency intraday returns to construct the realized volatility.

4.2.1.3 Model-Free Implied Volatility

Implied volatility is regarded as the expected future volatility as extracted from relevant option prices. It is equal to the volatility parameter σ, the value of which can be revealed when the option price is equal to its theoretical price according to the pricing formula. The Black-Scholes (Black & Scholes, 1973) option pricing formula is commonly used to calculate the implied volatility. Given an efficient market, option traders incorporate historical price information, and further information about future events that affect volatility, into the option price. Therefore, if the option market is efficient and the option pricing formula is correct, the implied volatility should subsume the information incorporated in past volatility and provide a more efficient volatility forecast (Taylor, 2005).

However, all these studies are based on Black-Scholes implied volatility from at-the-money options. Although at-the-money options are the most actively traded, these studies ignore the information incorporated in other options (Jiang & Tian, 2005). Meanwhile, the Black-Scholes implied volatility is criticized as being derived from a model based on constant volatility, and therefore inconsistent in forecasting changes in volatility (Britten-Jones & Neuberger, 2000). Most importantly, tests based on the Black-Scholes implied volatility are joint tests of the Black-Scholes option formula and the efficiency of the option market. Therefore, their conclusions are based on the assumption of correct option model. As a result, these studies suffer from misspecification errors and there is inconsistency stemming from the constant volatility assumption of the Black-Scholes model. Britten-Jones and Neuberger (2000) derive the model-free implied volatility from no-arbitrage conditions. In particular, all consistent processes for the price of underlying securities generate a common expectation of integrated variance under the risk-neutral measure over a specified horizon, and therefore imply the same forecast of volatility. Britten-Jones and Neuberger (2000) suggest that the common risk-neutral expectation of squared price volatility between the current date and the future date is given by the set of prices of options that expire on the two dates. Thus, they derive the forecast of volatility from the current option price via the risk-neutral integrated return variance.

Unlike traditional implied volatility measures, model-free implied volatility is independent of option pricing models and requires only current option price.

Therefore, it should not be subject to misspecification errors. Since it does not rely on the Black-Scholes pricing model or any variant thereof, the model-free implied volatility does not require a constant volatility assumption and thus bypasses the criticism on the inconsistency of previous implied volatility measures. The information efficiency of Britten-Jones and Neuberger (2000) model-free implied volatility is examined by Jiang and Tian (2005). They find that model-free implied volatility from S&P 500 index options subsumes all the information incorporated in historical realized volatility and the Black-Scholes implied volatility. Consequently, they suggest that model-free volatility is a more efficient and unbiased predictor for future volatility, compared with previous volatility measures.

According to Carr et al. (1998) and Britten-Jones and Neuberger (2000), the expectation of integrated variance under the risk-neutral measure can be calculated from a complete set of call option prices:

$$\sigma_{MF}^2(T_1, T_2) = E^Q\left[\int_{T_1}^{T_2} \sigma_t^2 \, dt\right] = 2\int_0^{\infty} \frac{c(T_2,K) - c(T_1,K)}{K^2} dK \qquad (5)$$

where $\sigma_{MF}^2(T_1, T_2)$ is the model-free implied volatility over the period from *T*1 to *T*2; *c*(*T*1; *K*) and *c*(*T*2; *K*) are the European type call option prices with strike price *K* and time to maturity *T*1 and *T*2, respectively; $E^Q\left[\int_{T_1}^{T_2} \sigma_t^2 \, dt\right]$ denotes the expectation operator under the risk-neutral measure. Under the assumption of zero dividend yield and interest rate, it implies that the model-free implied volatility measure from *T*1 to *T*2 is determined by a series of option prices with time to maturity at these two days. Because no assumption of underlying process or specific option pricing model is imposed, this measure is considered to be model-free.

4.2.2 Market Liquidity

4.2.2.1 Liquidity and Predictability for Returns

It is generally acknowledged that liquidity has an incremental influence on excess stock returns. Many papers investigate the relation between liquidity and stock returns by testing the impact of liquidity on contemporaneous stock returns. In the first study to focus on this relationship, Amihud and Mendelson (1986) adopt the quoted bid-ask spread as a proxy for illiquidity and discover that expected stock return is an increasing and concave function of illiquidity. Subsequent studies use alternative measures of liquidity, such as the marginal cost of trading, dollar trading volume, and turnover ratio, and present consistent conclusions (Brennan & Subrahmanyam, 1996).

In addition, a growing literature explores the relation between liquidity and future expected return, both theoretically and empirically. A number of theories and empirical results suggest that liquidity has substantial predictive power for future stock returns, on both the firm level and the aggregate stock market level (Amihud & Mendelson, 1986; Baker & Stein, 2004; Jones, 2002). These studies argue that increases in liquidity, such as higher turnover ratio, lower illiquidity ratio, lower price impact of trade, or lower bid-ask spread, forecast lower future returns.

Why is it that liquidity can predict future stock returns? The explanation is straightforward. Investors anticipate selling the stocks in the future, and know that the transaction cost will increase their cost of selling. The transaction cost may come from the problems of adverse selection or from the consideration of professional market-makers (Jones, 2002). If the transaction cost is high, the investors discount the asset by a higher rate and thus require higher stock returns. As a result, the stocks are observed to have lower liquidity. Higher transaction cost, lower turnover and higher illiquidity ratio are supposed to generate higher future returns (Amihud & Mendelson, 1986; Baker & Stein, 2004; Glosten & Milgrom, 1985). This theory fits well with a cross section of individual stocks and is empirically supported with cross-sectional results by Amihud and Mendelson (1986) and Brennan and Subrahmanyam (1996).

An alternative possible explanation for the cross-sectional relation between lagged liquidity and returns is from the perspective of behavioural finance. In the behavioural finance framework, investors are prone to over-optimism and over-pessimism. When irrational investors are excessively optimistic about the market, they will trade more actively and thus boost the liquidity. Conversely, when such investors are over-pessimistic, they avoid trading and holding equity, and thus reduce the turnover of the market. In both cases, the stock price will eventually revise to the fundamental. Hence, this behavioural theory implies that liquidity and future stock returns are negatively related (Jones, 2002).

However, these theories used to explain the link between liquidity and cross-sectional expected stock returns may not be directly applicable to the aggregate stock market. Specifically, these models provide little information on why the aggregate market liquidity presents variation over time or whether the variation of liquidity can affect the aggregate stock market (Baker & Stein, 2004; Chordia, Roll, & Subrahmanyam, 2000).

Considering the short-sale constraint and the existence of irrational overconfident investors, Baker and Stein (2004) propose a behavioural explanation for the relation between liquidity and future stock returns. Specifically, irrational investors overreact to the private information about future fundamentals and thus boost the liquidity. Given the short-sale constraints, irrational investors are active only when their valuations about future returns are higher than those of rational investors; hence, the market is overvalued. Therefore, higher liquidity is an indicator of higher presence of these irrational investors, and, as a result, of the extent to which the market is overvalued.

For the aggregate stock market, Jones (2002) studies the annual time series of liquidity and stock market returns over the entire 20th Century for the US market. He adopts three liquidity measures: bid-ask spread, aggregate realized transaction cost, and turnover ratio. The results show that these liquidity measures can predict the future stock market returns up to 3 years ahead. That is, higher turnover forecasts lower stock market returns, while higher spreads forecast higher stock market returns. Similar results are shown in Lesmond et al. (1999) and Bekaert, Harvey, and Lundblad (2007). However, Baker and Stein (2004) argue that the magnitude of the decrease in stock returns related to the increase in liquidity seems extremely large to be explained by theoretical models where the cost of trading influences the expected returns.

A number of papers investigate the relation between liquidity and stock market return by studying the components of liquidity. The literature decomposes the liquidity into the expected liquidity and unexpected liquidity. Amihud (2002) proposes that liquidity predicts future stock market returns due to the positive relation between expected illiquidity and ex ante excess stock market returns. Investors estimate the expected illiquidity based on the information available in one preceding year, and then use the forecast to set prices that generate desired expected returns. That is, if investors anticipate higher market illiquidity based on the one-preceding-year illiquidity information, they will generate higher expected return to compensate for the higher expected market illiquidity. Similarly, Bali, Cakici, Yan, and Zhang (2005) find that the expected liquidity is significantly related to the expected stock market return. This indicates that past liquidity information could impact the future market price movement. In addition, they argue that after controlling for the expected illiquidity and contemporaneous unexpected illiquidity, the explanatory power of volatility for the market return disappears.

4.2.2.2 Returns and Predictability for Liquidity

According to the asset pricing and behavioural finance explanations, causality must run from liquidity to stock returns. However, if we step back from this traditional view, and ask how the liquidity is generated, it is natural to expect that the past stock returns may influence the liquidity.

There is some empirical evidence for the relation between past stock returns and future illiquidity. Smirlock and Starks (1988) use Granger-causality tests to investigate the empirical link between daily stock returns and trading volume for individual stocks in the US market from 15 June to 21 August 1981. They document significant causal relation from stock returns to the trading volume, and this relationship tends to be stronger in the periods surrounding earnings announcement. The results imply that delivery of information to investors follows a sequential rather than simultaneous process. In the case of simultaneous arrival of information, all the investors receive the information simultaneously, revise their expectation and trade. Thus, past returns offer no information superior to past volume for the future volume. In the case of sequential information arrival, investors receive information one at a time and then trade after reception. Therefore, in this case, past stock returns can provide information to improve volume forecasts over forecasts based on past volume alone. Lakonishok and Smidt (1986) show that higher daily positive price movement leads to higher liquidity for individual stocks. However, Tse (1991) and Saatcioglu and Starks (1998) find that past performance cannot significantly affect the future liquidity at market level in Japan and six Latin American markets.

There is no generally agreed explanation for the relation between past stock returns and future liquidity. The tax explanation theory predicts that more trading will occur in the stocks that have poor past performance; however, this contradicts the empirical finding of the positive relation between past returns and liquidity. Theory of trading based on heterogeneity due to difference in information lacks convincing arguments for the relation between information asymmetries and past returns. This is because, in order to explain the return-liquidity relation, such information asymmetries need to increase following positive stock price movement; however, current studies are unable to offer convincing arguments as to why this should be so.

Chordia, Roll, and Subrahmanyam (2002) employ Stoll's (1978) inventory model to explain the relation between past stock return and liquidity. Liquidity can be decomposed into two components: one due to asymmetric information and the other due to inventory costs (Glosten & Harris, 1988). For the aggregate stock market, asymmetric information is unlikely to exist; hence it cannot determine the market illiquidity. Then the inventory paradigm provides a more cogent explanation for the association between liquidity and stock returns at the market-wide level. This model states that the liquidity depends on the inventory holding cost, which arises from financing constraints and risk. Such cost seems particularly high in falling markets, where market marker inventory levels might be high, and is lower in rising markets. Thus, liquidity will follow the previous market moves, declining following past stock market return falls, and increasing after past market return rises. The empirical results of Chordia et al. (2002) support this theory. They adopt daily data over the period 1988-1992 and use bid-ask spread as proxy for illiquidity. They document that stock market returns predict liquidity rather than vice versa for the US market. In addition, inventory cost theory applies to liquidity drying up in falling markets. First, the influence of financial constraints is asymmetric; for example, the short-sales restriction significantly affects the trading activities in down markets. Second, market makers are more risk-averse when stock prices decrease, and the fear of future liquidity shocks causes them to be unwilling to provide liquidity at the current time (Bernardo & Welch, 2004). The results of Chordia et al. (2002) show that positive market price movement is followed by increases in liquidity of much smaller magnitude than those following the negative market price movement. In contrast, using an asymmetric VAR, Griffin et al. (2004) show a symmetric reaction of liquidity to past stock returns.

Behaviour theories also provide possible explanations for the link between past stock returns and liquidity. According to the disposition effect proposed by Shefrin and

Statman (1985), investors are reluctant to trade in down markets and wish to realize the gains in up markets. This implies that past stock returns impact investors' trading activities and thus affect liquidity. Odean (1998) draws on overconfidence bias theory to claim that overconfidence causes investors to trade more frequently and thus increases the liquidity. In addition, Gervais and Odean (2001) argue that overconfidence grows with past success in the market, hence liquidity increases following positive market returns. Statman, Thorley, and Vorkink (2006) find that overconfidence bias at the market level and the disposition effect at the stock level could explain the positive relation between past stock return and liquidity for the developed markets. However, these competing behaviour theories cannot explain the findings in Griffin et al. (2004). Since investors are considered to be more overconfident in a long-term up market, while the disposition effect makes investors more willing to lock in gains in such markets, both disposition effect and overconfidence theory show a stronger return-liquidity relation in the periods following high stock market returns. In that case, investors in developed markets would be expected to trade more in the 1990s relative to the 1980s, in line with the better market performance. However, Griffin et al. (2004) find contrary evidence.

An alternative explanation for the positive association between past return and liquidity is the cost of participation. (Griffin et al., 2004) Orosel (1998) participation model assumes the existence of sidelined investors. Such investors could but do not invest in the stock market because of the participation costs, such as trading and information costs. High stock market returns will induce these investors to increase their estimated profitability of the market and thus be more willing to participate. As a result, market participation rises following high past returns and falls following low past returns. Therefore, the participation model predicts a positive link between past stock returns and future liquidity. Moreover, this model suggests a symmetric return-liquidity relation in up and down markets. The model implies a stronger return-liquidity relation in the 1980s relative to the 1990s in developed countries, owing to the existence of more sidelined investors in the 1980s, and greater market participation in the 1990s. This is supported by the evidence of Griffin et al. (2004). With a large sample of weekly data in 46 countries over the period 1983-2003, Griffin et al. (2004) examine several possible explanations for the link between past stock return and liquidity. They find a positive relationship between past stock returns and future trading activity, which is measured by turnover. Their results show that an up market predicts higher liquidity, with approximately the same magnitude of effect as for a previous down market. Also, they find that the return-liquidity relation is more pronounced in the 1980s than in the 1990s in developed economies. Thus, they confirm the participation cost explanation for the return-liquidity relation.

Bekaert et al. (2007) adopt monthly data from 19 emerging markets and the US market over the period 1987-2003 and study the return-liquidity relation. They employ a VAR analysis with relative number of zero trading days as illiquidity proxy and discover a positive association between past returns and future liquidity in emerging markets. However, in contrast to the finding of Chordia et al. (2002), Bekaert et al. (2007) results reveal that the effect of past stock returns on future liquidity is not significant in the US. Also, they document that past returns can predict future market liquidity in emerging markets. Moreover, Bekaert et al. (2007) point out that the participation cost, which is supported by Griffin et al. (2004), cannot explain their findings.

Hence, the literature on the return-liquidity relation has not come to a generally agreed conclusion; nor has there been a comprehensive examination on that relation. Therefore, it is important to comprehensively study the direction and magnitude of the return-liquidity relation. Different liquidity measures capture different dimensions of market liquidity. In Chordia et al. (2002), bid-ask spread captures the trading cost dimension; Griffin et al. (2004) adopt turnover ratio to capture the trading quantity dimension; Bekaert et al. (2007) use relative number of zero trading days to capture the trading speed dimension of liquidity. Adopting a different approach, Amihud (2002) liquidity measure captures the price impact dimension of the market liquidity. Moreover, unlike the other liquidity measures, Amihud (2002) illiquidity ratio does not rely on the microstructure data and thus allows the study on the return-liquidity relation to cover long periods of time (Amihud, 2002). To date this measure has not been used to study the return-liquidity relation from the price impact aspect of liquidity. Therefore, such research is necessary.

Finally, the association between the variance risk premium and market liquidity has not yet been investigated in the literature. If stock market returns have a substantial influence on the market liquidity, then it is plausible that the variance risk premium also impacts the liquidity. If this is the case, we could observe a much stronger link between liquidity and stock market returns or variance risk. Thus, it is clearly important to test the direction of causality.

4.3 Data and Methodology

4.3.1 Variance Risk Premium (VRP)

According to Bollerslev et al. (2009), Carr and Wu (2009) and Drechsler and Yaron (2011), the variance risk premium (*VRP*) is defined as the difference between risk-neutral and physical expected variances:

$$VRP_t = E_t^Q(Var_{t,t+1}) - E_t^P(Var_{t,t+1})$$

where Q and P represent the risk-neutral and physical probability measures, respectively, and $E(\cdot)$ is the expectation operator. Variance risk premium reflects investors' risk aversion to volatility risk (Bakshi & Madan, 2006; Bollerslev et al., 2011; Bollerslev et al., 2009). Bollerslev et al. (2009) and Drechsler and Yaron (2011) suggest that the variance risk premium is induced by the uncertainty of consumption related to macroeconomic uncertainty through a recursive utility framework, and hence it shows a strong predictive power for stock market returns.

In empirical investigation, however, the literature diverges on how to construct the measure of variance risk premium, especially in the calculation of expected physical variances. For example, Bollerslev et al. (2009) directly use the ex post realized return variation over $[t-1, t]$ time interval, which is actually the lagged realized variance over $[t, t+1]$. This method is only valid under the assumption of martingale process for the realized variance. As a result, the realized volatility would behave like a unit root process with first order autocorrelation coefficient almost equal to one.

On the other hand, Drechsler and Yaron (2011) argue that high frequency S&P 500 cash index returns may be subject to the autocorrelation existing in the "stable" index when summing up 500 separate individual stock prices. Instead, they consider the high frequency S&P 500 futures realized variance forecasts by projecting futures realized variance on VIX and lagged index realized variance. Their slope coefficients are statistically significant and slightly larger than those in Bollerslev et al. (2009), with an increasing pattern from monthly horizon to quarterly horizon. They also consider the robust regression method, which adopts an iterative reweighted least squares algorithm to down-weight the impact of outliers on estimates, and provides estimation as statistically efficient as OLS in the absence of outliers. Drechsler and Yaron (2011) investigate the return predictability by the variance premium with OLS regression and robustness regression. Their results show that the robust regression estimates are similar to the OLS estimates in both sign and magnitude. Thus they exclude the possibility that their results are driven by outliers.

In another paper, following the usual practice in the variance swap market, Carr and Wu (2009) use ex post forward realized variance from daily price as measure of expected realized variance. Although they do not directly consider an asset return predictability regression in their paper, they demonstrate a highly significant negative relationship between log difference of realized variance and implied variance (which is the opposite of the variance premium used above) and future excess return for the stock index and many of the individual stocks considered on a monthly basis.

In this study, we construct the measure of variance risk premium using the respective methods of Bollerslev et al. (2009), Carr and Wu (2009) and Drechsler and Yaron (2011). The variance premium of Bollerslev et al. (2009) is denoted by VRP^{BTZ}, that of Carr and Wu (2009) is denoted by VRP^{CW} and that of Drechsler and Yaron (2011) is denoted by VRP^{DY}.

4.3.2 Illiquidity

A number of illiquidity proxies have been advanced, such as quoted bid-ask spread (Amihud & Mendelson, 1986), marginal cost of trading (Brennan & Subrahmanyam, 1996), and the probability of information based trading (Easley, Hvidkjaer, & O'Hara, 2002). These illiquidity measures, however, are calculated from microstructure data on quotes and transactions, which is unavailable for the long periods required by most studies of the return-liquidity relation (Amihud, 2002).

Therefore, in this paper, we use Amihud (2002) illiquidity ratio, which is based on readily available data (daily volumes and daily returns) and captures the price impact dimension of liquidity. This illiquidity measure, denoted by *ILLIQ*, is the average ratio of absolute stock return to the trading volume in dollars on the same day.

$$ILLIQ_i = \frac{1}{D_i}\sum_{d=1}^{D_i}\frac{\left|R_{i,d}\right|}{VOLD_{i,d}} \tag{6}$$

where $R_{i,d}$ is the return on stock i on day d, $VOLD_{i,d}$ is the corresponding daily volume in dollars, and D_i is the number of days with data available for stock i during the pre- and post- addition measurement periods. The Amihud (2002) illiquidity measure is widely used in the literature as the proxy for liquidity. (Acharya and Pedersen, 2005; Korajczyk and Sadka, 2008; Goyenko and Ukhov, 2009) This liquidity measure is attractive as it could be easily calculated for long time period given the wide availability of trading volume and returns data. Additionally, this illiquidity proxy has a strong theoretical appeal. Amihud (2002) illiquidity ratio presents the average daily price response associated with a dollar of trading volume, which renders it a good proxy for the theoretically founded Kyle's price impact coefficient (Hasbrouck, 2005; Miralles and Miralles, 2006; Goyenko et al. 2009). By studying eight liquidity measures, Korajczyk and Sadka (2008) find that Amihud (2002) illiquidity measure and turnover are the only two measures that are priced in the cross-section of stock returns. Goyenko et al. (2009) run horseraces of various liquidity measures, such as effective spread and price impact ratio, in the U.S. market. They find Amihud's (2002) illiquidity ratio is one of the best performers and do well in measuring price impact.

4.3.3 Data and Sample

In this paper, we use the monthly data of variance risk premium, illiquidity, and excess stock returns for the US market over the period extending from January 1992 to December 2010. In our empirical investigations, we divide the full sample into three subsamples: 1992 to 2006, 1994 to 2008, and 1996 to 2010.

First, we use five-minute intraday returns of the S&P 500 index obtained from the Institute for Financial Markets to construct the monthly realized volatility, and employ the monthly end VIX index as a proxy for model-free implied volatility. The VIX index is downloaded from the CBOE (Chicago Board of Options Exchange). According to the white papers published by the CBOE, the VIX index is the risk-neutral expectation of future 30 days return variance inferred from every day option trading data. We use the VIX index at the last trading day of every trading month as expectation of next month, so that we can obtain a non-overlapping sample. VIX has been widely used in the literature as a proxy for the risk-neutral expected volatility (e.g., Bollerslev et al. (2009) Drechsler and Yaron (2011). According to Eq.(1), using the methods of Bollerslev et al. (2009), Carr and Wu (2009) and Drechsler and Yaron (2011) to construct the expected realized variance, we obtain three measures of variance risk premium, denoted by VRP^{BTZ}, VRP^{CW} and VRP^{DY}, respectively.

Second, we consider the illiquidity for the S&P 500 index and the aggregate stock market (NYSE), respectively. We obtain the daily returns, prices, and trading volumes of stocks from CRSP. According to Eq. (6), we construct the monthly illiquidity ratio for the NYSE ($ILLIQ^{NYSE}$), and that for the S&P 500 index ($ILLIQ^{SP500}$).

Third, we also consider two stock return measures: the monthly excess returns on a value-weighted market portfolio (denoted by VW), and the S&P 500 index excess return (denoted by $INDEX$). We download the monthly value-weight return, the S&P 500 index return and the risk-free rate from CRSP. We obtain the monthly data during our sample period for the Fama-French factors ($R_m - R_f$, SMB , and HML) and the momentum factor (MOM) from Ken French's website**.**

Finally, our forecasting analysis considers a number of economic predictors as control variables; specifically, we use price-earning ratio (PE), dividends yields (DY), default spread ($DFSP$), term spread ($TMSP$), and the stochastically de-trended risk-free rate ($RREL$), defined as the one-month T-bill rate minus its backward twelve-month moving averages. The monthly price-earning ratio and dividend yields for the S&P 500 are obtained from Standard & Poor's. The other economic data are downloaded from the public website of the Federal Reserve Bank of St. Louis.

Table 4.1 reports the summary statistics for all variables used in this paper, namely variance risk premium (VRP^{BTZ}, VRP^{CW} and VRP^{DY}), illiquidity ratio ($ILLIQ^{NYSE}$ and $ILLIQ^{SP500}$), stock return (VW and $INDEX$), and economic variables (PD, PE, $DFSP$, $TMSP$, and $RREL$). As shown, the means for VRP^{BTZ}, VRP^{CW} and VRP^{DY} are 17.93, 17.92 and 18.51, respectively, while the standard deviations for VRP^{BTZ}, VRP^{CW} and VRP^{DY} are 20.95, 32.80 and 22.83 respectively. This suggests that, relative to Bollerslev et al. (2009) variance risk premium measure, Drechsler and Yaron's (2011) measure is slightly more volatile. Table 1 also illustrates that the illiquidity of the aggregate stock market is higher in both the mean and the standard deviation than that of the S&P 500 index. As for the portfolio return measures, the aggregate stock market return and S&P 500 index return present similar mean and standard deviation. The means for VW and $INDEX$ are 0.50 and 0.39, respectively, while the standard deviations for VW and $INDEX$ are 4.32 and 4.38, respectively.

Table 4.1: Summary Statistics. This table shows the summary statistics of the variables used in this study. The variables are liquidity measures （*ILLIQ*^{NYSE} and *ILLIQ*^{SP500}), variance risk premium (*VRP*^{BTZ}, *VRP*^{CW} and *VRP*^{DY}), return proxies (*VW* and *INDEX*) and control variables (*PD, PE, DFSP, TMSP* and *RREL*). The analysis uses monthly data from Jan 1992 to Dec 2010.
Tables and Figures

	ILLIQ^{NYSE}	*ILLIQ*^{SP500}	*VW*	*INDEX*	*VRP*^{BTZ}	*VRP*^{CW}	*VRP*^{DY}	*PD*	*PE*	*DFSP*	*TMSP*	*RREL*
Mean	-2.39	-7.25	0.50	0.39	17.93	17.92	18.51	3.97	3.19	0.94	1.86	-0.15
Median	-2.05	-7.10	0.97	0.94	13.79	14.94	12.44	4.01	3.12	0.83	1.78	-0.05
Maximum	0.06	-4.99	9.59	9.07	116.52	124.45	206.57	4.49	4.81	3.38	3.76	1.86
Minimum	-4.71	-9.24	-16.86	-18.58	-180.68	-350.28	-41.73	3.38	2.71	0.55	-0.53	-2.51
Std. Dev.	1.20	1.15	4.32	4.38	20.95	32.80	22.83	0.28	0.41	0.45	1.23	0.90
Skewness	-0.16	0.09	-0.70	-0.90	-2.77	-6.07	3.84	-0.12	2.00	3.13	-0.13	-0.58
Kurtosis	2.03	1.90	4.17	4.76	39.57	72.55	27.03	2.19	7.91	14.49	1.72	3.04
Jarque-Bera	9.88	11.93	31.50	60.11	12993.74	47146.38	6044.01	6.80	381.29	1627.72	16.26	12.60
Probability	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Sum	-544.86	-1653.63	114.82	89.46	4088.11	4067.59	4219.45	904.53	728.38	215.31	423.75	-34.05
Sum Sq. Dev.	324.29	301.04	4227.54	4358.32	99640.97	243067.90	118281.20	18.42	37.96	46.81	340.98	181.98
Observations	228	228	228	228	228	227	228	228	228	228	228	228

Table 4.2: Correlation Matrix. This table shows the correlations among the variables used in this study. The variables are liquidity measures ($ILLIQ^{NYSE}$ and $ILLIQ^{SP500}$), variance risk premium (VRP^{BTZ}, VRP^{CW} and VRP^{DY}), return proxies (*VW* and *INDEX*) and control variables (*PD, PE, DFSP, TMSP* and *RREL*). The analysis uses monthly data from Jan 1992 to Dec 2010.

	$ILLIQ^{NYSE}$	$ILLIQ^{SP500}$	*VW*	*INDEX*	VRP^{BTZ}	VRP^{CW}	VRP^{DY}	*PD*	*PE*	*DFSP*	*TMSP*	*RREL*
$ILLIQ^{NYSE}$	1.000											
$ILLIQ^{SP500}$	0.954	1.000										
VW	-0.015	0.020	1.000									
INDEX	-0.016	0.020	0.999	1.000								
VRP^{BTZ}	0.045	0.008	0.001	0.004	1.000							
VRP^{CW}	0.102	0.070	0.009	0.006	0.283	1.000						
VRP^{DY}	-0.007	-0.045	-0.558	-0.582	0.085	0.097	1.000					
PD	-0.253	-0.339	0.089	0.087	0.161	0.047	0.035	1.000				
PE	0.129	-0.010	-0.052	-0.065	0.231	0.296	0.296	0.044	1.000			
DFSP	-0.214	-0.312	-0.154	-0.168	0.025	0.192	0.237	-0.287	0.690	1.000		
TMSP	0.259	0.179	-0.049	-0.048	-0.009	0.032	0.017	-0.505	0.216	0.294	1.000	
RREL	-0.159	-0.013	0.096	0.100	-0.258	-0.183	-0.122	0.123	-0.611	-0.492	-0.369	1.000

Table 4.2 presents the correlation matrix for these variables. High correlation is shown between illiquidity for the NYSE and the S&P 500 index, and the two portfolio return measures. Also, we find that illiquidity for the NYSE is negatively related to contemporaneous market portfolio returns, while illiquidity for the S&P 500 is positively related to contemporaneous portfolio returns. For the variance risk premium, we find that VRP^{BTZ} and VRP^{CW} have positive correlation with contemporaneous illiquidity and index return, while in the case of VRP^{DY} , the relationship is negative.

4.3.4 Methodology

Theoretically, liquidity and variance premium are exogenous variables and expected to be the determinants of return. However, it is possible that the two-direction relation exists. That is, return may also affect liquidity and variance risk premium.

4.3.4.1 Granger-Causality Test

The first step to investigate the relation among variance premium, return and unexpected illiquidity is the Granger-causality test. This test is employed to examine the Granger-causality relations among these variables. Time series x is said to granger cause time series y, if the past values of x could significantly predict the present value of y and not vice versa. We test the causal relation between variance premium and index return by the application of bivariate VAR model. The lag length of the VAR model is chosen by optimizing the Akaike Information Criterion. And we test the two-way relations, that is, we examines whether variance premium could granger cause index return, and whether index return could granger cause variance premium. Also, we investigate the granger-causality relations between unexpected illiquidity and index return, and between variance premium and unexpected illiquidity.

We seek to answer whether or not variance premium could cause the index return with one unrestricted model and one restricted model. The unrestricted model is regression of returns on the lagged returns and lagged variance premium. The model will be estimated with OLS and provide the unrestricted RSS. The restricted model is regression of returns solely on the lagged returns. Also, we run this model to obtain the restricted RSS. Then the F-statistics would be constructed with restricted RSS and unrestricted RSS. Then we could know whether or not the restricted form could be rejected with the F-statistic. If the restricted form could be rejected in this case, it means that variance risk premier could cause the index returns. The same test procedure is employed for testing the causal relations between unexpected illiquidity and index return, and between variance risk premier and unexpected illiquidity.

In the next step, we add some exogenous variables to the VAR models, including P/E ratio, dividends yields, default spread (between Moody's BAA and AAA corporate bond spreads), term spread (between the ten-year T-bond and the three-month T-bill yields), and the stochastically detrended risk-free rate (the one-month T-bill rate minus its backward twelve-month moving averages). (Bollerslev et al., 2009) This procedure makes us look into the relationships among variance risk premium, return and unexpected illiquidity after considering the impact of these exogenous variables.

4.3.4.2 Impulse Responses Functions

The Granger-causality test in VAR could tell whether or not variance premium could significantly impact the future values of index return. However, it could not reveal whether the sign of the impact is positive or negative and how long it will take for the impact to work through the VAR system. The impulse response function gives answers to these questions by examining the dynamic behaviour of the VAR system. Also, the impulse response functions can be used to predict the responses from variance premium to the index return. The figure of the impulse response presents the responsiveness of returns to a 1% exogenous change in the variance risk premium.

Thereby, from the impulse responses figures, we could know the sign of the impact and whether the impact is long-run persistence or just a temporary jump. So the third step in our main empirical test is the impulse response.

4.4 Empirical Results

4.4.1 Granger-causality Test

Table 4.3 presents the p-values of the chi-square statistics for the Granger-causality tests between the illiquidity and stock returns (Panel A of Table 4.3); between variance risk premium and stock returns (Panel A of Table 4.3); and between variance risk premium and illiquidity (Panel B of Table 4.3).

With respect to the causal relation between illiquidity and stock returns, there is insufficient evidence that illiquidity, however measured, can impact the future stock returns. However, the results illustrate that illiquidity, both for the aggregate market and the S&P 500 index portfolios, can be significantly Granger-caused by stock returns. The significance level is 1% for the full sample and all sub-samples. Thus, there exists unidirectional causality from stock return to illiquidity, which is consistent with the finding of Chordia et al. (2002).

For the Granger-causality relation between variance risk premium and stock returns on the aggregate stock market and S&P 500 index portfolios, there is compelling evidence that the variance risk premium Granger-causes stock returns. Table 4.3 shows strong evidence of causality running from the variance risk premium for all measures to the stock market returns. For VRP^{BTZ} and VRP^{CW}, the significance levels for the full period and the sub-periods are 1%. Meanwhile, VRP^{DY} can significantly cause the aggregate stock market return for the full period 1992-2010, and the sub-periods 1992-2006 and 1996-2010. There is no vice versa relation. For the full period and all sub-periods, we cannot reject the null hypothesis that stock returns do not cause the variance risk premium. Thus, we conclude that the variance risk premium leads to stock market returns.

Panel B of Table 3 illustrates the causal relation between illiquidity and variance risk premium. As shown, the variance risk premium significantly Granger-causes illiquidity. The only exception is the causal relation from VRP^{BTZ} to illiquidity for the S&P 500 index, which is insignificant for the full period 1992-2010 and the sub-period 1996-2010. We cannot reject the null hypothesis that the illiquidity measures do not cause variance risk premium.

In summary, first, stock market return Granger-causes illiquidity, while illiquidity cannot significantly affect the stock return. Second, stock returns do not cause variance risk premium, but variance risk premium does significantly affect the stock returns. Third, illiquidity cannot Granger-cause the variance risk premium, while there is significant evidence that variance risk premium can impact the market illiquidity.

Table 4.4 reports results for the Granger-causality tests between illiquidity and stock market return; between variance risk premium and stock market return; and between illiquidity and variance risk premium, after controlling for a number of economic variables. The control variables are price-earnings ratio, dividend yields, default spread, term spread, and the stochastically de-trended risk-free rate reported in Table 4.1. The results for the Granger-causality tests in Table 4.4 are consistent with those in Table 4.3. Specifically, after controlling for the economic variables, the variance risk premium significantly Granger-causes stock market returns across the full sample period and all subsample periods, and also causes the market illiquidity. Hence, we can conclude that even after controlling for these economic variables, variance risk premium has an incremental effect on the stock returns and market illiquidity, while stock returns and illiquidity do not cause the variance risk premium. Moreover, stock market returns Granger-cause illiquidity and not vice versa.

Table 4.3: Granger-Causality Test without Control Variables. This table presents the p-value of the chi-square statistics for the Granger-causality tests between illiquidity and stock return (reported in Panel A), between variance risk premium and stock return (reported in Panel A), and between variance risk premium and illiquidity (reported in Panel B). The analysis uses monthly data from full sample period Jan 1992 to Dec 2010, sub-period Jan 1992-Dec 2006, sub-period Jan 1994-Dec 2008, and sub-period Jan 1996-Dec 2010.

Panel A: *ILLIQ* & Stock Return, *VRP* & Stock Return

	X1	*VW*		*INDEX*	
X2	Sample period	X1->X2	X2->X1	X1->X2	X2->X1
$ILLIQ^{NYSE}$	1992-2010	0.000	0.470	0.000	0.467
	1992-2006	0.000	0.974	0.000	0.940
	1994-2008	0.000	0.168	0.000	0.192
	1996-2010	0.000	0.463	0.000	0.520
$ILLIQ^{SP500}$	1992-2010	0.000	0.287	0.000	0.278
	1992-2006	0.000	0.408	0.000	0.413
	1994-2008	0.000	0.044	0.000	0.052
	1996-2010	0.000	0.213	0.000	0.249
VRP^{BTZ}	1992-2010	0.634	0.000	0.612	0.000
	1992-2006	0.328	0.001	0.190	0.001
	1994-2008	0.305	0.005	0.443	0.007
	1996-2010	0.187	0.001	0.203	0.000
VRP^{CW}	1992-2010	0.164	0.000	0.110	0.000
	1992-2006	0.476	0.000	0.388	0.000
	1994-2008	0.729	0.000	0.643	0.000
	1996-2010	0.029	0.000	0.018	0.000
VRP^{DY}	1992-2010	0.421	0.007	0.428	0.006
	1992-2006	0.181	0.071	0.195	0.098
	1994-2008	0.388	0.658	0.414	0.599
	1996-2010	0.428	0.015	0.427	0.022

Panel B: *VRP* & *ILLIQ*

	X1	VRP^{BTZ}		VRP^{CW}		VRP^{DY}	
X2	Sample period	X1->X2	X2->X1	X1->X2	X2->X1	X1->X2	X2->X1
$ILLIQ^{NYSE}$	1992-2010	0.036	0.685	0.000	0.409	0.000	0.802
	1992-2006	0.002	0.444	0.084	0.464	0.000	0.880
	1994-2008	0.087	0.271	0.000	0.018	0.000	0.886
	1996-2010	0.035	0.004	0.000	0.032	0.000	0.620
$ILLIQ^{SP500}$	1992-2010	0.158	0.768	0.000	0.574	0.000	0.179
	1992-2006	0.000	0.446	0.000	0.674	0.000	0.651
	1994-2008	0.082	0.354	0.000	0.048	0.000	0.536
	1996-2010	0.900	0.005	0.000	0.050	0.000	0.246

Table 4.4: Granger-Causality Test with Control Variables. This table presents the p-value of the chi-square statistics for the Granger-causality tests with control variables (*PD, PE, DFSP, TMSP* and *RREL*) between illiquidity and stock return (reported in Panel A), between variance risk premium and stock return (reported in Panel A), and between variance risk premium and illiquidity (reported in Panel B). The analysis uses monthly data from full sample period Jan 1992 to Dec 2010, sub-period Jan 1992- Dec 2006, sub-period Jan 1994-Dec 2008, and sub-period Jan 1996-Dec 2010.

Panel A: *ILLIQ* & Stock Return, *VRP* & Stock Return

	X1	*VW*		*INDEX*	
X2	Sample period	X1->X2	X2->X1	X1->X2	X2->X1
$ILLIQ^{NYSE}$	1992-2010	0.000	0.967	0.000	0.984
	1992-2006	0.000	0.275	0.000	0.319
	1994-2008	0.000	0.147	0.000	0.143
	1996-2010	0.000	0.943	0.000	0.868
$ILLIQ^{SP500}$	1992-2010	0.000	0.684	0.000	0.734
	1992-2006	0.000	0.128	0.000	0.258
	1994-2008	0.000	0.012	0.000	0.012
	1996-2010	0.000	0.654	0.000	0.730
VRP^{BTZ}	1992-2010	0.205	0.000	0.216	0.000
	1992-2006	0.255	0.000	0.249	0.000
	1994-2008	0.231	0.043	0.182	0.060
	1996-2010	0.224	0.000	0.237	0.000
VRP^{CW}	1992-2010	0.596	0.000	0.504	0.000
	1992-2006	0.432	0.000	0.359	0.000
	1994-2008	0.911	0.000	0.870	0.000
	1996-2010	0.615	0.000	0.532	0.000
VRP^{DY}	1992-2010	0.339	0.000	0.354	0.000
	1992-2006	0.732	0.001	0.763	0.002
	1994-2008	0.173	0.000	0.179	0.000
	1996-2010	0.447	0.002	0.466	0.002

Panel B: *VRP* & *ILLIQ*

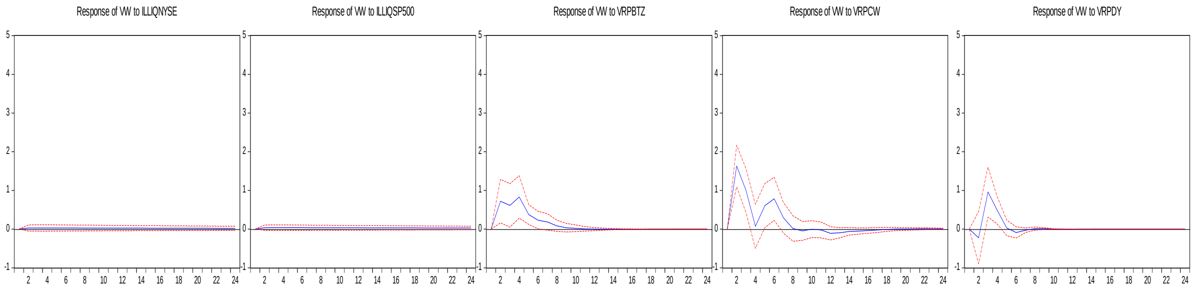
	X1	VRP^{BTZ}		VRP^{CW}		VRP^{DY}	
X2	Sample period	X1->X2	X2->X1	X1->X2	X2->X1	X1->X2	X2->X1
$ILLIQ^{NYSE}$	1992-2010	0.086	0.920	0.000	0.606	0.000	0.944
	1992-2006	0.002	0.475	0.003	0.832	0.000	0.541
	1994-2008	0.009	0.068	0.000	0.837	0.000	0.136
	1996-2010	0.114	0.255	0.000	0.364	0.000	0.282
$ILLIQ^{SP500}$	1992-2010	0.837	0.681	0.000	0.576	0.000	0.353
	1992-2006	0.000	0.323	0.001	0.608	0.000	0.380
	1994-2008	0.013	0.020	0.000	0.832	0.000	0.145
	1996-2010	0.837	0.681	0.000	0.289	0.000	0.173

4.4.2 Impulse Response Functions

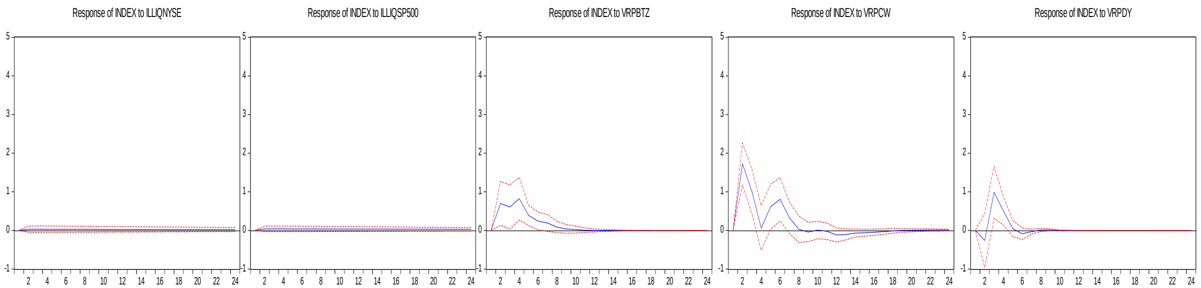
Figure 4.1 depicts the estimated impulse response functions for illiquidity, stock market return, and variance risk premium for twenty-four months. Figure 4.2 plots the estimated cumulative impulse response functions. Both Figure 4.1 and Figure 4.2 are plotted according to the VAR model for the full sample period from January 1992 to December 2010. The estimated response is represented by the solid line, with the confidence intervals (two standard errors) represented by the dashed lines. If the dashed lines contain zero (cross the horizontal axis), this implies that the effect is statistically insignificant. In each impulse response function graph in Figures 4.1 and 4.2, the horizontal axis represents the months relative to the shock. Month 1 is the month of the shock; Month 2 is the first month after the shock, etc. The vertical axis in Figure 4.1 refers to the percentage change in each variable in the month following a one standard deviation increase in another variable. The vertical axis in Figure 4.2 records the magnitude of the accumulated response, measured as a percentage change, from the month of innovation.

Figure 4.1: Impulse Responses Functions for Stock Returns, Illiquidity and Variance Risk Premium. Figure 1 plots the estimated impulse response functions for illiquidity, stock return and variance risk premium for twenty-four months. These figures are based on the VAR model for the full sample period from Jan 1992 to Dec 2010. Panel A presents the impulse response function for *VW* following a one standard deviation innovation in illiquidity and variance risk premium. Panel B presents the impulse response function for *INDEX* to illiquidity and variance risk premium. Panel C illustrates the response of illiquidity for NYSE to one unit change in index return and variance risk premium. Panel D reports the response for illiquidity for S&P500 index to the change in stock return and variance risk premium. The impulse response functions for variance risk premium to the illiquidity and stock return are reported in Panel E, Panel F and Panel G, respectively. The solid lines refer to the response of each variable in the month (represented in the horizontal axis of each figure) following one standard deviation in other variable. The magnitude of the response, measured as percentage change, is reported in the vertical axis in each figure. The dashed lines refer to the confidence intervals at two standard errors.

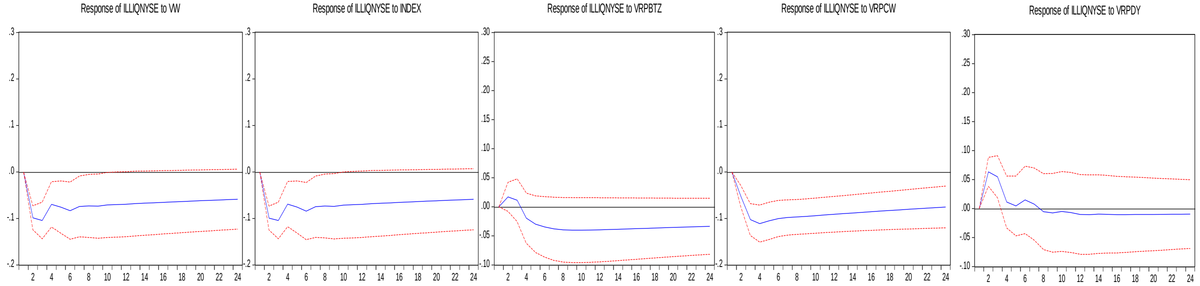
Panel A: The Response of *VW*



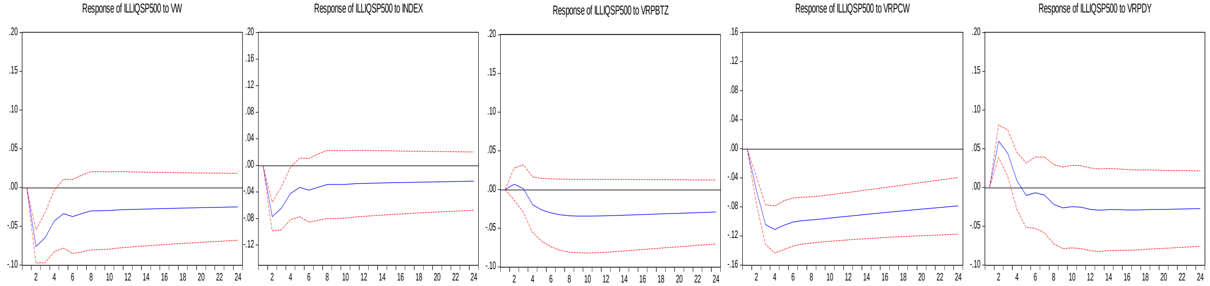
Panel B: The Response of *INDEX*



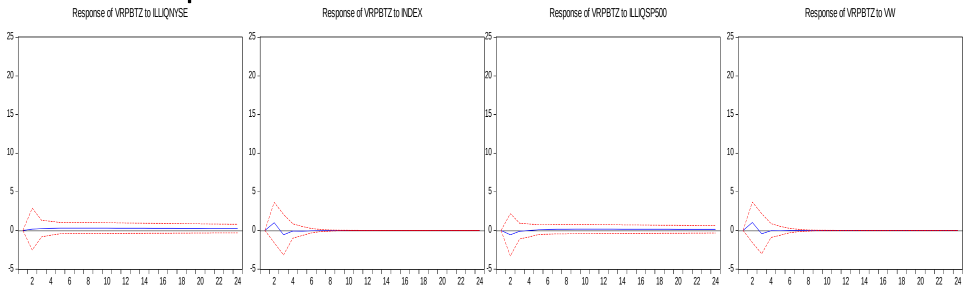
Panel C: The Response of $ILLIQ^{NYSE}$



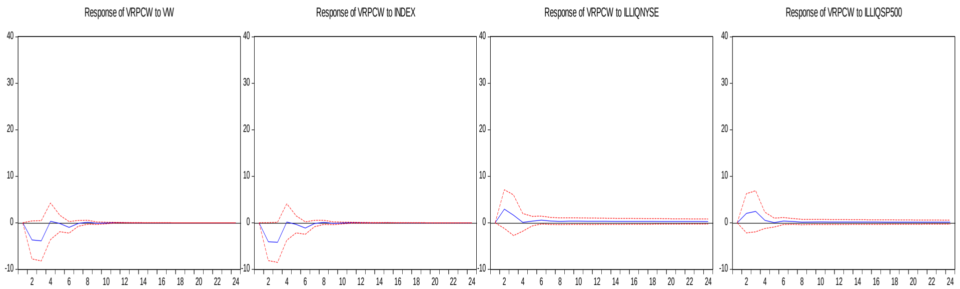
Panel D: The Response of $ILLIQ^{SP500}$



Panel E: The Response of VRP^{BTZ}



Panel F: The Response of VRP^{CW}



Panel G: The Response of VRP^{DY}

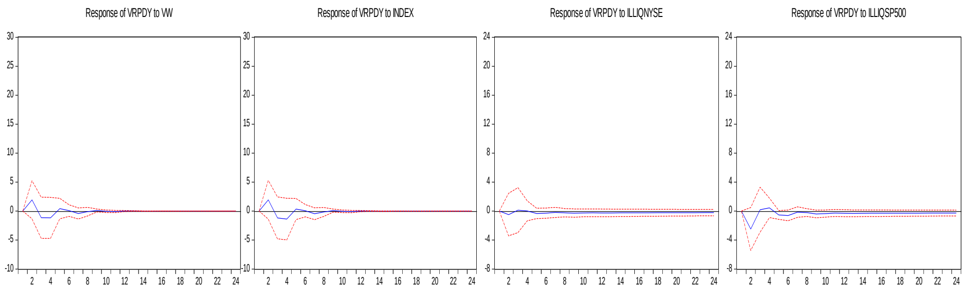
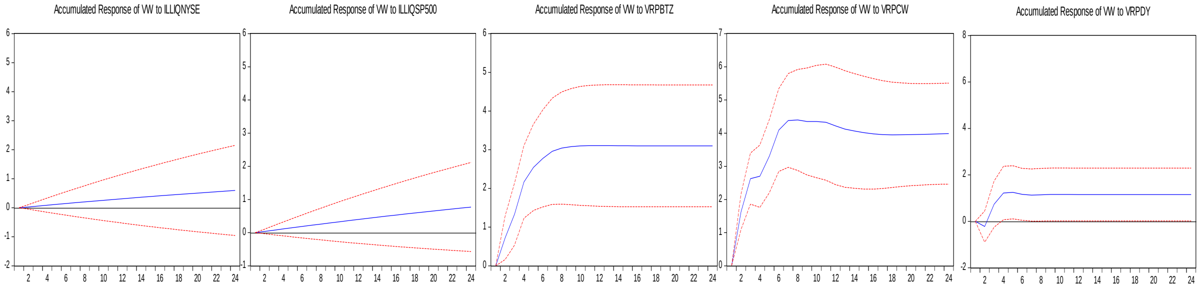
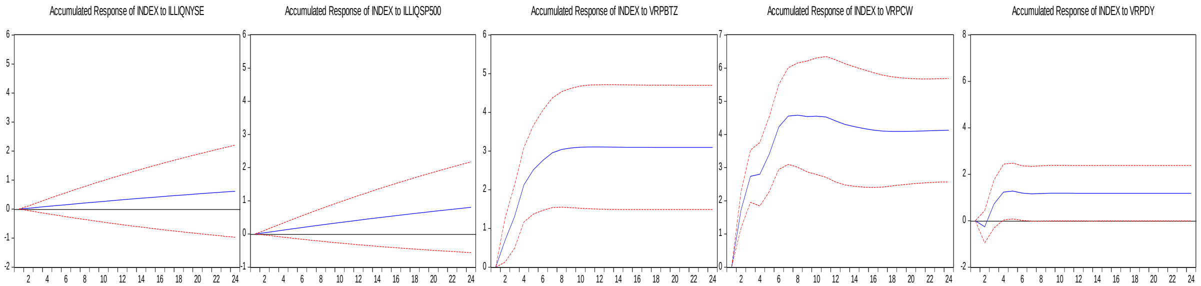


Figure 4.2: Cumulative Impulse Responses Functions for Stock Returns, Illiquidity, and Variance Risk Premium. Figure 2 presents the estimated impulse response functions for illiquidity, stock return, and variance risk premium for twenty-four months. The figures are based on the VAR model for the full sample period from Jan 1992 to Dec 2010. Panel A presents the cumulative impulse response function for *VW* to illiquidity and variance risk premium. Panel B presents the cumulative impulse response function for *INDEX* to illiquidity and variance risk premium. Panel C illustrates the response of illiquidity for NYSE to one unit change in stock return and variance risk premium. Panel D reports the response of illiquidity for S&P 500 index to the change in stock return and variance risk premium. The impulse response functions for variance risk premium to the illiquidity and return are reported in Panel E, Panel F and Panel G, respectively. The solid lines refer to the accumulated response for each variable from the month of innovation (represented in the horizontal axis of each figure). The magnitude of the response, measured as percentage change, is reported in the vertical axis in each figure. The dashed lines refer to the confidence intervals at two standard errors.

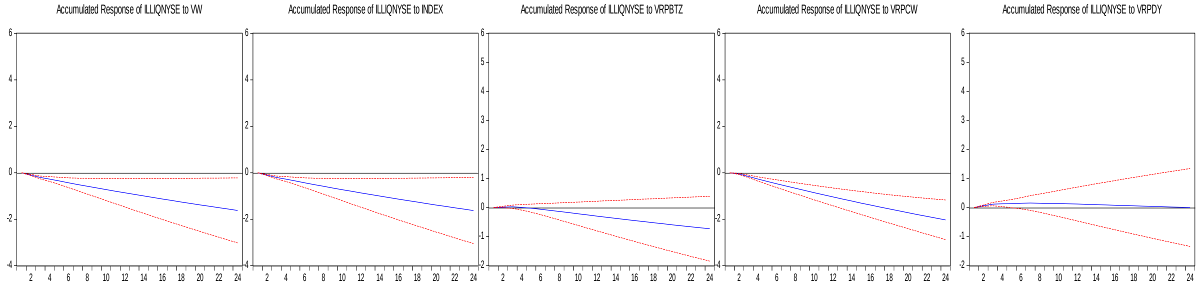
Panel A: Accumulated Response of *VW*



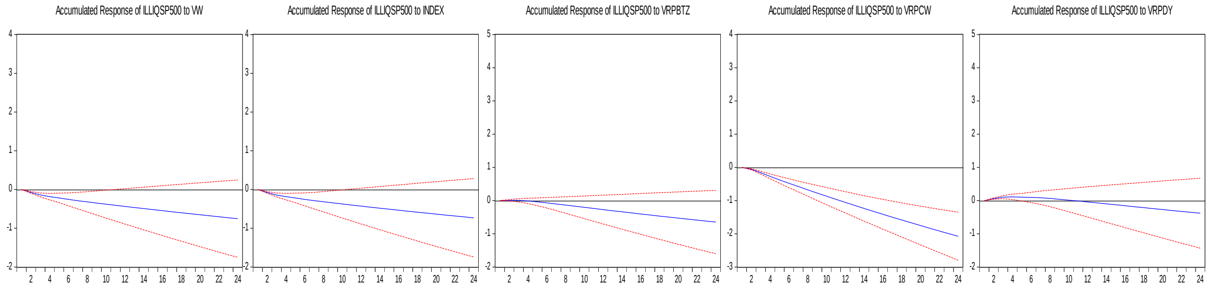
Panel B: Accumulated Response of *INDEX*



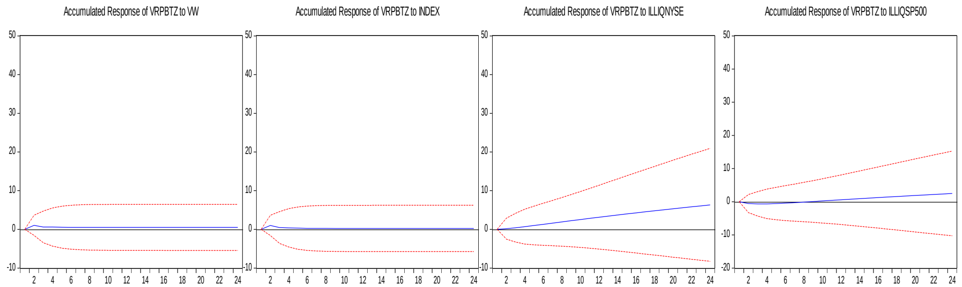
Panel C: Accumulative Response of $ILLIQ^{NYSE}$



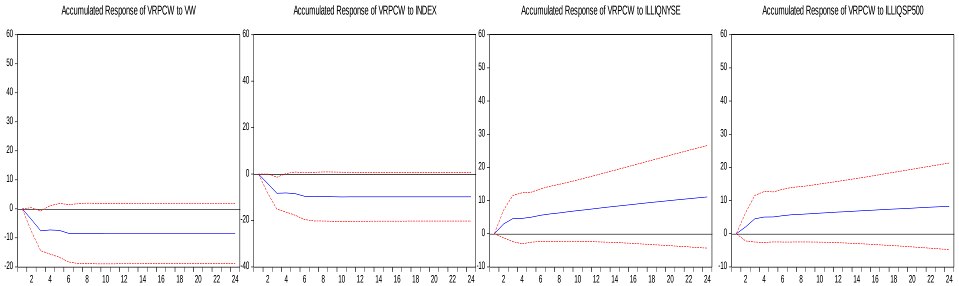
Panel D: Accumulative Response of $ILLIQ^{SP500}$



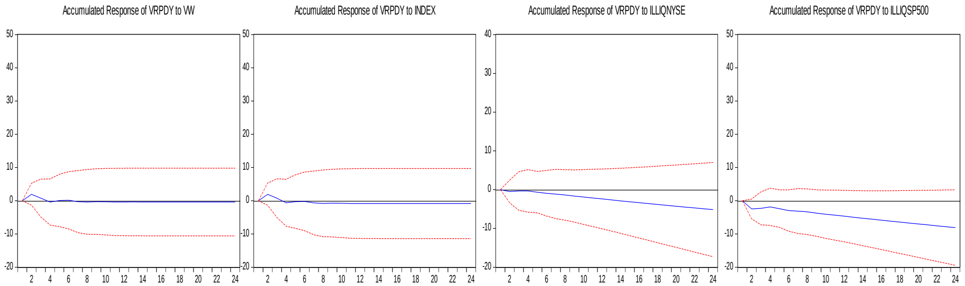
Panel E: Accumulative Response of VRP^{BTZ}



Panel F: The Response of VRP^{CW}



Panel G: Accumulative Response of VRP^{DY}



In Panel A of Figure 4.1, we present the impulse response functions for the aggregate stock market returns in reaction to illiquidity and variance risk premium. As shown, there is no impulse response for stock returns in reaction to illiquidity. This is consistent with our results from the Granger-causality tests, that illiquidity measures for both the aggregate stock market and S&P 500 index portfolios have no effects on the stock returns. In contrast, the variance risk premium significantly and positively affects the stock returns. In response to a one standard deviation disturbance in VRP^{BTZ}, stock market return starts increasing in the first month, then reaches 1% in the third month, and finally declines slowly from the fourth month. For the first five months, the impulse response function is above the horizontal line and the standard error lines do not contain zero. This implies that VRP^{BTZ} has lasting positive effects on stock market returns using conventional confidence intervals. Similar patterns of impulse response are shown for the other two variance risk premium measures, VRP^{CW} and VRP^{DY}. In addition, our results are robust for S&P 500 index returns, as shown in Panel B.

Panels C and D of Figure 4.1 display the response of illiquidity to one unit change in stock returns and variance risk premium. As shown, one standard deviation disturbance originating from VW and $INDEX$ result in around 1% decrease in market illiquidity for the first two months. Then the impulse response goes down slightly from the sixth month. The impulse response of illiquidity to the variance risk premium measures for the full sample period displays different patterns. The significant impulse response to VRP^{BTZ} cannot be observed in the long run using conventional levels of confidence. The third figure in Panel C shows that one standard deviation disturbance originating from illiquidity for the S&P 500 index results in around 1% decrease in VW in the first two months. Then the shock lasts over the long term. The impulse response of illiquidity to VRP^{DY} is positive over the first four months and then gradually dies out, with zero contained in the two standard error lines all the time. Panel D reports the results for the S&P 500 index. Compared with the results in Panel C, the response of illiquidity for the S&P 500 index to the variance risk premium has a quite similar pattern. Also, the response to the stock returns is significant in the first four months and then dies out. Thus, Panels C and D show that stock market returns have considerable impact on the illiquidity in the short term, and the impact of stock returns on illiquidity in the S&P 500 index lasts longer than the impact on market illiquidity. In addition, it can be seen that, over the full sample period, the impacts of different variance risk premium measures on illiquidity show different patterns using conventional confidence intervals. Overall, in the short run, both S&P 500 index returns and most variance risk premium measures can significantly affect illiquidity.

The impulse response functions of variance risk premium to the illiquidity and stock market returns are reported in Panel E, Panel F, and Panel G, respectively. The figures show that the impulse responses of variance risk premium to both the stock market returns and illiquidity cannot be significantly observed. Thus, it appears that neither stock market returns nor illiquidity impact the variance risk premium.

The cumulative impulse response functions presented in Figure 4.2 confirm the conclusions drawn from Figure 4.1. It is simply another method to present the pattern of the response of one variable to a one unit change in each of the other variables. For example, the third figure in Panel A of Figure 4.2 illustrates the accumulated response of the aggregate stock market returns to VRP^{BTZ} : the accumulated impulse response increases to 3% in the first 5 months, which is consistent with the positive impulse response over the same period shown in Panel A of Figure 4.1.

4.4.3 Predictability of Variance Risk Premium and Illiquidity

The prediction of excess stock market returns has long been discussed in the literature. Numerous methods and variables have been advanced to forecast future stock returns. The typical specification used in the return forecast is presented in equation (7), which regresses excess stock market returns on lagged predictors.

$$R_{t+1} = \alpha + \beta x_t + \varepsilon_t \qquad (7)$$

where R_{t+1} is the excess stock market return at time *t*+1, x_t is the predictor at time *t*, and the significance of coefficient β is used to test the predictive power for the excess stock returns. In order to test whether illiquidity and variance risk premium are able to predict future excess stock returns, we run the regressive model (7) based on the illiquidity, variance risk premium, a number of economic variables and 2007-2008 financial crisis dummy variables. In particular, the model (7) can be regarded as a benchmark model when x_t represents financial crisis dummy (FC) and the conventional economic predictors price-earning ratio (PE), dividends yields (DY), default spread ($DFSP$), term spread ($TMSP$), and the stochastically de-trended risk-free rate ($RREL$).

$$R_{t+1} = \alpha + \beta_1\, DY_t + \beta_2\, PE_t + \beta_3\, DFSP_t + \beta_4\, TMSP_t + \beta_5\, RREL_t + \beta_6\, FC_t + \varepsilon_t \tag{8}$$

To test the incremental predictability of illiquidity and variance risk premium, we run the following multivariate regression models in which the economic predictors, financial crisis dummy and variance risk premium/illiquidity are incorporated:

$$R_{t+1} = \alpha + \beta_1\, VRP_t + \beta_2\, DY_t + \beta_3\, PE_t + \beta_4\, DFSP_t + \beta_5\, TMSP_t + \beta_6\, RREL_t + \beta_7\, FC_t + \beta_8\, FC * VRP_t + \varepsilon_t \tag{9}$$

$$R_{t+1} = \alpha + \beta_1\, ILLIQ_t + \beta_2\, DY_t + \beta_3\, PE_t + \beta_4\, DFSP_t + \beta_5\, TMSP_t + \beta_6\, RREL_t + \beta_7\, FC_t + \beta_8\, FC * ILLIQ_t + \varepsilon_t \tag{10}$$

Table 4.5 presents the results for the benchmark model (Panel A) and those for the forecasting power of variance risk premium (Panel B and Panel D) and illiquidity (Panel C and Panel E). We report the estimates and the Newey-West *t*-statistic for coefficients of all the predictors used in the regression. We also report the F-statistic of each regression. Results for the aggregate stock market are shown in Panel B and Panel D, and results for the S&P 500 index returns are reported in Panel B and Panel E.

As shown in Table 4.5, the predictability of economic variables in the benchmark model can be enhanced by the variance risk premium rather than by illiquidity according to the Newey-West *t*-statistic. Specifically, Panel A of Table 4.5 shows that the coefficients of all economic variables are insignificant, and these predictors cannot generate a statistically significant F-statistic. This is consistent with the empirical finding of Welch and Goyal (2008), that the economic variables show limited predictive power for the excess stock returns. However, when the variance risk premium is incorporated into the regressions, the F-statistic increases remarkably and all coefficients of variance risk premium measures are significant. In contrast, when the illiquidity is incorporated, the regressions do not generate a statistically significant F-statistic. Thus, there is insufficient evidence for us to reject the null hypothesis that illiquidity can forecast the future excess stock market returns. This is consistent with our results from the Granger test.

Table 4.5: Stock Return Prediction with Illiquidity and Variance Risk Premium. This table presents the results for the predictive power of variance risk premium (Panel B and Panel D) and illiquidity (Panel C and Panel E). Panel A reports the benchmark model. The dependent variable is market excess return (*VW* and *INDEX*), the independent variables are the lagged (once) VRP (VRP^{BTZ}, VRP^{CW} and VRP^{DY}), ILLIQ ($ILLIQ^{NYSE}$ and $ILLIQ^{SP500}$), control variables (*PD, PE, DFSP, TMSP* and *RREL*), 2007-2008 financial crisis dummy and the slope dummy (interaction term between financial crisis dummy and VRP, ILLIQ). The benchmark modes are reported in Panel A. We report the estimates of coefficients and the corresponding *t*-values reported in parentheses for all the predictors used in the regression. This table also reports the F statistics. The reported coefficients and *t*-statistic are estimated using OLS with bootstrap (taking correlation of independent variables into account).

Panel A: Benchmark model

	Dep.	Cons	*PD*	*PE*	*DFSP*	*TMSP*	*RREL*	*FC*	*F*
1992-2010	*VW*	3.772	-0.714	0.062	0.281	-0.276	0.136	-2.827*	1.144
		(0.69)	(-0.55)	(0.04)	(0.19)	(-0.72)	(0.26)	(-1.81)	
1992-2006	*VW*	2.647	0.610	-1.136	-1.139	0.035	0.190		0.494
		(0.50)	(0.36)	(-0.42)	(-0.53)	(0.10)	(0.30)		
1994-2008	*VW*	3.088	1.712	-2.807	-0.462	-0.094	-0.182	-2.019	1.442
		(0.53)	(0.91)	(-1.21)	(-0.25)	(-0.26)	(-0.34)	(-1.48)	
1996-2010	*VW*	8.647	-2.079	0.493	-0.593	-0.168	0.165	-2.759	1.135
		(0.96)	(-0.93)	(0.31)	(-0.33)	(-0.38)	(0.25)	(-1.65)	
1992-2010	*INDEX*	4.075	-0.794	0.061	0.170	-0.267	0.148	-2.878*	1.143
		(0.75)	(-0.61)	(0.04)	(0.11)	(-0.68)	(0.28)	(-1.77)	
1992-2006	*INDEX*	3.235	0.690	-1.479	-1.103	0.062	0.154		0.543
		(0.62)	(0.40)	(-0.54)	(-0.51)	(0.18)	(0.24)		
1994-2008	*INDEX*	3.369	1.865	-3.153	-0.393	-0.082	-0.203	-2.133	1.499
		(0.58)	(0.98)	(-1.34)	(-0.21)	(-0.22)	(-0.38)	(-1.52)	
1996-2010	*INDEX*	8.727	-2.108	0.488	-0.678	-0.158	0.188	-2.799	1.125
		(0.97)	(-0.94)	(0.31)	(-0.37)	(-0.35)	(0.28)	(-1.61)	

Panel B: Predictive Power of *VRP* for *VW*

	Dep.	Cons	*PD*	*PE*	*DFSP*	*TMSP*	*RREL*	*FC*	VRP^{BTZ}	FC_VRP^{BTZ}	VRP^{CW}	FC_VRP^{CW}	VRP^{DY}	FC_VRP^{DY}	*F*
1992-2010	*VW*	3.549	-0.904	-0.078	0.083	-0.066	0.654	-1.160	0.064***	-0.024					14.661***
		(0.65)	(-0.70)	(-0.05)	(0.06)	(-0.17)	(1.24)	(-0.77)	(3.25)	(-1.08)					
1992-2006	*VW*	5.479	1.133	-3.434	-0.047	0.205	0.199		0.065***						2.079*
		(1.01)	(0.67)	(-1.21)	(-0.02)	(0.62)	(0.31)		(2.90)						
1994-2008	*VW*	3.512	2.658	-5.085	1.230	0.050	0.032	-1.199	0.070***	-0.057					9.701***
		(0.60)	(1.21)	(-1.62)	(0.65)	(0.14)	(0.05)	(-0.85)	(3.02)	(-1.64)					
1996-2010	*VW*	3.224	-1.102	0.262	-0.219	0.084	0.880	-0.784	0.067***	-0.024					14.739***
		(0.38)	(-0.51)	(0.16)	(-0.12)	(0.19)	(1.27)	(-0.48)	(3.33)	(-1.05)					
1992-2010	*VW*	4.731	-0.781	-0.713	-1.244	0.152	0.735	0.807			0.118***	-0.073***			47.291***
		(0.93)	(-0.67)	(-0.49)	(-0.98)	(0.44)	(1.50)	(0.65)			(7.48)	(-4.47)			
1992-2006	*VW*	7.387	1.409	-4.841*	0.054	0.384	0.323				0.122***				9.296***
		(1.44)	(0.94)	(-1.95)	(0.03)	(1.28)	(0.59)				(6.12)				
1994-2008	*VW*	3.505	4.341***	-7.864***	1.485	0.409	0.142	0.395			0.131***	-0.083***			21.667***
		(0.63)	(2.75)	(-3.47)	(0.93)	(1.33)	(0.33)	(0.38)			(6.09)	(-3.82)			
1996-2010	*VW*	3.947	-0.888	-0.361	-1.570	0.334	1.006	1.282			0.121***	-0.076***			45.164***
		(0.49)	(-0.43)	(-0.22)	(-0.97)	(0.84)	(1.59)	(0.91)			(7.32)	(-4.44)			
1992-2010	*VW*	2.078	-0.986	0.652	0.007	-0.024	0.747	0.189					0.039**	-0.102***	1.933*
		(0.38)	(-0.76)	(0.44)	(0.00)	(-0.07)	(1.58)	(0.14)					(2.09)	(-3.30)	
1992-2006	*VW*	4.693	0.946	-2.624	-0.875	0.196	0.189						0.048***		1.799*
		(0.86)	(0.57)	(-0.95)	(-0.42)	(0.58)	(0.30)						(2.74)		
1994-2008	*VW*	2.284	0.979	-2.094	0.108	0.025	0.416	0.218					0.048***	-0.098***	2.295**
		(0.38)	(0.49)	(-0.74)	(0.06)	(0.07)	(0.72)	(0.16)					(2.66)	(-2.96)	
1996-2010	*VW*	4.309	-1.886	1.215	-0.702	0.153	0.995	0.630					0.040**	-0.107***	1.915*
		(0.49)	(-0.86)	(0.75)	(-0.39)	(0.36)	(1.62)	(0.44)					(2.11)	(-3.39)	

Panel C: Predictive Power of *ILLIQ* for *VW*

	Dep.	Cons	*PD*	*PE*	*DFSP*	*TMSP*	*RREL*	*FC*	$ILLIQ^{NYSE}$	FC_ILLIQ^{NYSE}	$ILLIQ^{SP500}$	FC_ILLIQ^{SP500}	*F*
1992-2010	*VW*	3.371	-0.939	0.254	0.618	-0.190	0.231	-15.066	-0.104	-2.989			0.877
		(0.59)	(-0.58)	(0.17)	(0.32)	(-0.51)	(0.45)	(-1.37)	(-0.27)	(-1.17)			
1992-2006	*VW*	1.554	2.881	-3.591	-0.108	0.095	0.149		0.603				0.529
		(0.29)	(0.94)	(-0.88)	(-0.04)	(0.28)	(0.23)		(0.98)				
1994-2008	*VW*	1.651	4.382	-5.649	0.782	-0.019	-0.221	0.568	0.724	0.346			1.529
		(0.26)	(1.09)	(-1.29)	(0.29)	(-0.05)	(-0.41)	(0.03)	(1.12)	(0.09)			
1996-2010	*VW*	7.104	-1.920	0.535	0.062	-0.052	0.333	-15.750	0.018	-3.231			0.827
		(0.73)	(-0.84)	(0.34)	(0.03)	(-0.12)	(0.47)	(-1.37)	(0.03)	(-1.19)			
1992-2010	*VW*	2.885	-0.398	-0.069	1.092	-0.174	0.271	-34.060			0.121	-3.612	0.854
		(0.53)	(-0.23)	(-0.04)	(0.52)	(-0.47)	(0.54)	(-1.36)			(0.30)	(-1.28)	
1992-2006	*VW*	3.736	4.885	-5.441	1.558	0.185	-0.080				1.027		0.721
		(0.71)	(1.47)	(-1.33)	(0.52)	(0.53)	(-0.13)				(1.63)		
1994-2008	*VW*	4.045	6.670*	-7.579*	2.487	0.098	-0.425	-0.292			1.230**	0.054	1.968*
		(0.69)	(1.74)	(-1.91)	(0.85)	(0.26)	(-0.83)	(-0.01)			(2.01)	(0.02)	
1996-2010	*VW*	11.095	-1.819	0.116	0.540	0.049	0.433	-39.881			0.491	-4.337	0.868
		(1.11)	(-0.82)	(0.07)	(0.25)	(0.11)	(0.65)	(-1.48)			(0.88)	(-1.43)	

Panel D: Predictive Power of *VRP* for *INDEX*

	Dep.	Cons	*PD*	*PE*	*DFSP*	*TMSP*	*RREL*	*FC*	VRP^{BTZ}	FC_VRP^{BTZ}	VRP^{CW}	FC_VRP^{CW}	VRP^{DY}	FC_VRP^{DY}	*F*
1992-2010	*INDEX*	3.821	-0.979	-0.058	-0.016	-0.065	0.651	-1.282	0.061***	-0.021					12.828***
		(0.70)	(-0.75)	(-0.04)	(-0.01)	(-0.17)	(1.22)	(-0.81)	(3.09)	(-0.96)					
1992-2006	*INDEX*	5.991	1.199	-3.716	-0.040	0.228	0.162		0.063***						2.033*
		(1.12)	(0.70)	(-1.30)	(-0.02)	(0.68)	(0.25)		(2.84)						
1994-2008	*INDEX*	3.830	2.853	-5.477*	1.262	0.062	-0.015	-1.330	0.069***	-0.058					8.538***
		(0.66)	(1.26)	(-1.71)	(0.65)	(0.17)	(-0.02)	(-0.91)	(2.98)	(-1.63)					
1996-2010	*INDEX*	3.479	-1.177	0.286	-0.317	0.087	0.886	-0.899	0.064***	-0.021					12.960***
		(0.41)	(-0.55)	(0.18)	(-0.17)	(0.19)	(1.26)	(-0.52)	(3.19)	(-0.93)					
1992-2010	*INDEX*	4.995	-0.855	-0.710	-1.374	0.169	0.755	0.782			0.118***	-0.069***			52.829***
		(0.98)	(-0.72)	(-0.48)	(-1.06)	(0.48)	(1.53)	(0.61)			(7.50)	(-4.22)			
1992-2006	*INDEX*	8.002	1.493	-5.205**	0.097	0.413	0.288				0.123***				9.785***
		(1.58)	(0.99)	(-2.08)	(0.05)	(1.35)	(0.53)				(6.17)				
1994-2008	*INDEX*	3.705	4.573***	-8.298***	1.539	0.441	0.129	0.341			0.132***	-0.080***			24.318***
		(0.68)	(2.86)	(-3.62)	(0.96)	(1.41)	(0.30)	(0.33)			(6.17)	(-3.69)			
1996-2010	*INDEX*	4.110	-0.946	-0.351	-1.696	0.355	1.044	1.276			0.122***	-0.072***			50.322***
		(0.51)	(-0.46)	(-0.21)	(-1.02)	(0.87)	(1.63)	(0.89)			(7.32)	(-4.20)			
1992-2010	*INDEX*	2.258	-1.062	0.691	-0.085	-0.015	0.770	0.172					0.037*	-0.103***	1.774*
		(0.42)	(-0.81)	(0.47)	(-0.06)	(-0.04)	(1.62)	(0.13)					(1.97)	(-3.08)	
1992-2006	*INDEX*	5.234	1.018	-2.933	-0.845	0.220	0.153						0.047***		1.783*
		(0.97)	(0.61)	(-1.05)	(-0.40)	(0.64)	(0.24)						(2.70)		
1994-2008	*INDEX*	2.494	1.059	-2.310	0.156	0.034	0.415	0.149					0.047***	-0.099***	2.221**
		(0.42)	(0.52)	(-0.79)	(0.09)	(0.09)	(0.72)	(0.11)					(2.62)	(-2.77)	
1996-2010	*INDEX*	4.424	-1.956	1.264	-0.791	0.166	1.034*	0.633					0.038**	-0.108***	1.759*
		(0.51)	(-0.89)	(0.78)	(-0.43)	(0.39)	(1.68)	(0.43)					(2.00)	(-3.18)	

Panel E: Predictive Power of *ILLIQ* for *INDEX*

	Dep.	Cons	*PD*	*PE*	*DFSP*	*TMSP*	*RREL*	*FC*	*ILLIQ*^{NYSE}	*FC_ILLIQ*^{NYSE}	*ILLIQ*^{SP500}	FC_ILLIQ^{SP500}	*F*
1992-2010	*INDEX*	3.756	-1.088	0.299	0.466	-0.179	0.238	-15.649	-0.137	-3.109			0.874
		(0.65)	(-0.67)	(0.20)	(0.23)	(-0.47)	(0.46)	(-1.35)	(-0.36)	(-1.16)			
1992-2006	*INDEX*	2.220	2.800	-3.761	-0.145	0.118	0.116		0.560				0.545
		(0.43)	(0.90)	(-0.91)	(-0.05)	(0.34)	(0.18)		(0.90)				
1994-2008	*INDEX*	2.090	4.245	-5.692	0.815	-0.018	-0.226	-0.493	0.669	0.142			1.551
		(0.33)	(1.02)	(-1.26)	(0.30)	(-0.04)	(-0.42)	(-0.03)	(1.01)	(0.04)			
1996-2010	*INDEX*	6.570	-1.881	0.581	-0.033	-0.048	0.331	-16.174	-0.053	-3.302			0.822
		(0.67)	(-0.82)	(0.37)	(-0.02)	(-0.11)	(0.46)	(-1.34)	(-0.09)	(-1.17)			
1992-2010	*INDEX*	3.207	-0.574	-0.018	0.917	-0.167	0.281	-34.920			0.086	-3.701	0.847
		(0.59)	(-0.33)	(-0.01)	(0.43)	(-0.44)	(0.55)	(-1.33)			(0.21)	(-1.26)	
1992-2006	*INDEX*	4.298	4.862	-5.682	1.529	0.209	-0.110				1.002		0.729
		(0.82)	(1.44)	(-1.36)	(0.50)	(0.59)	(-0.17)				(1.58)		
1994-2008	*INDEX*	4.327	6.640*	-7.748*	2.502	0.102	-0.434	-1.360			1.196*	-0.050	1.958*
		(0.75)	(1.71)	(-1.91)	(0.84)	(0.26)	(-0.84)	(-0.04)			(1.93)	(-0.01)	
1996-2010	*INDEX*	10.515	-1.856	0.175	0.401	0.047	0.442	-40.256			0.418	-4.368	0.842
		(1.05)	(-0.83)	(0.11)	(0.18)	(0.10)	(0.65)	(-1.44)			(0.74)	(-1.38)	

4.5 Robustness Tests

There is empirical evidence to show that variance risk premium/illiquidity is highly related with equity returns (Amihud, 2002; Carr & Wu, 2009; Smirlock & Starks, 1988). However, we cannot know whether the significant relation is quasi-rational behaviour or simply serendipitous or a function of economically rational expectation. Without understanding why variance risk premium/illiquidity is significantly related to the equity returns, we cannot be confident that the significant association is robust.

Therefore, we study how the variance risk premium/illiquidity is related to the US equity returns. Specifically, we investigate whether the variance risk premium/illiquidity has a systematic and direct association with the Fama-French three factors, i.e., market risk premium ($R_m - R_f$), size factor (*SMB*) and value factor (*HML*) (Fama & French, 1993), and also with the momentum factor (*MOM*) (Carhart, 1997). We find the associations between variance risk premium/illiquidity and market risk premium in the Granger tests; hence, in the robustness check, we extend our investigation to the relation between variance risk premium/illiquidity and other systematic risk factors contained in the augmented Fama and French (1993) three-factor model.

To do so, we run the Granger-causality test again between variance risk premium/illiquidity and the risk factors ($R_m - R_f$, *SMB, HML* and *MOM*). Table 4.6 presents the results for the Granger-causality test with no control variables. Panel A of Table 4.6 shows that variance risk premium causes the market risk premium, value factor and momentum factor for the full sample period and most of the sub-sample periods, while it cannot cause the size factor. On the other hand, there is limited evidence to reject the null hypothesis that any of the four risk factors can cause the variance risk premium. Panel B of Table 4.6 demonstrates that there is one-way causality running from market risk premium and momentum to illiquidity. For the causal relationships between illiquidity and the size and value factors, causality relation is significantly evidenced in only a few sample periods.

Table 4.7 reports the results for the Granger-causality test with control variables (price-earnings ratio, dividend yields, default spread, term spread, and the stochastically de-trended risk-free rate). The results are similar to those in Table 4.6. In Table 4.7, we find significant one-way Granger-causality relation running from the variance risk premium to the market risk premium and momentum factors in the full sample period and all the sub-sample periods.

In summary, the variance risk premium Granger causes the market risk premium, value factor and momentum factor, and hence may affect the equity returns. In particular, this result is remarkable for the market risk premium and the momentum factor. It indicates that the variance risk premium affects equity returns as its changes are reflected in the time-varying systematically priced market risk premium, value factor and momentum factor. Also, the results show that illiquidity does not significantly Granger-cause any of the risk factors, namely market risk premium, size, value and momentum factors. This implies that illiquidity cannot affect equity returns through the risk factors included in the augmented Fama and French (1993) model. Conversely, two risk factors, market risk premium and momentum factor, can Granger-cause the illiquidity.

Table 4.6: Variance Risk Premium, Illiquidity, and Risk Factors. This table presents the p-value of the chi-square statistics for the Granger-causality tests between VRP and risk factors ($R_m - R_f$, *SMB, HML* and *MOM*) (reported in Panel A), and between illiquidity and risk factors ($R_m - R_f$, *SMB, HML* and *MOM*) (reported in Panel B). The analysis uses monthly data from full sample period Jan 1992 to Dec 2010, sub-period Jan 1992-Dec 2006, sub-period Jan 1994-Dec 2008, and sub-period Jan 1996-Dec 2010.

Panel A: *VRP* & Risk Factors ($R_m - R_f$, *SMB, HML* and *MOM*)

	X1	VRP^{BTZ}		VRP^{CW}		VRP^{DY}	
X2	Sample period	X1->X2	X2->X1	X1->X2	X2->X1	X1->X2	X2->X1
$R_m - R_f$	1992-2010	0.000	0.597	0.000	0.110	0.007	0.523
	1992-2006	0.004	0.284	0.000	0.064	0.061	0.249
	1994-2008	0.007	0.534	0.000	0.539	0.693	0.554
	1996-2010	0.000	0.207	0.000	0.018	0.015	0.542
SMB	1992-2010	0.428	0.389	0.076	0.137	0.088	0.769
	1992-2006	0.781	0.200	0.062	0.014	0.253	0.784
	1994-2008	0.510	0.147	0.116	0.100	0.067	0.713
	1996-2010	0.504	0.365	0.112	0.143	0.075	0.887
HML	1992-2010	0.048	0.024	0.004	0.416	0.001	0.984
	1992-2006	0.004	0.190	0.001	0.689	0.006	0.373
	1994-2008	0.469	0.438	0.202	0.730	0.003	0.978
	1996-2010	0.581	0.011	0.006	0.388	0.001	0.882
MOM	1992-2010	0.001	0.328	0.003	0.219	0.000	0.596
	1992-2006	0.000	0.669	0.287	0.396	0.019	0.277
	1994-2008	0.266	0.049	0.145	0.112	0.039	0.501
	1996-2010	0.007	0.410	0.011	0.311	0.002	0.602

Panel B: *ILLIQ* & Risk Factors ($R_m - R_f$, *SMB, HML* and *MOM*)

	X1	$ILLIQ^{NYSE}$		$ILLIQ^{SP500}$	
X2	Sample period	X1->X2	X2->X1	X1->X2	X2->X1
$R_m - R_f$	1992-2010	0.501	0.000	0.373	0.000
	1992-2006	0.917	0.000	0.454	0.000
	1994-2008	0.203	0.000	0.231	0.000
	1996-2010	0.550	0.000	0.348	0.000
SMB	1992-2010	0.121	0.161	0.265	0.115
	1992-2006	0.639	0.037	0.354	0.782
	1994-2008	0.275	0.254	0.732	0.617
	1996-2010	0.610	0.129	0.776	0.818
HML	1992-2010	0.475	0.080	0.812	0.133
	1992-2006	0.998	0.002	0.605	0.016
	1994-2008	0.798	0.008	0.362	0.079
	1996-2010	0.951	0.188	0.524	0.322
MOM	1992-2010	0.951	0.000	0.929	0.000
	1992-2006	0.796	0.000	0.874	0.000
	1994-2008	0.715	0.000	0.709	0.000
	1996-2010	0.712	0.000	0.837	0.000

Table 4.7: Variance Risk Premium, Illiquidity, and Risk Factors with Control Variables. This table presents the p-value of the chi-square statistics for the Granger-causality tests with control variables (*PD, PE, DFSP, TMSP* and *RREL*) between VRP and risk factors ($R_m - R_f$, *SMB, HML* and *MOM*) (reported in Panel A), and between illiquidity and risk factors ($R_m - R_f$, *SMB, HML* and *MOM*) (reported in Panel B). The analysis uses monthly data from full sample period Jan 1992 to Dec 2010, sub-period Jan 1992-Dec 2006, sub-period Jan 1994-Dec 2008, and sub-period Jan 1996-Dec 2010.

Panel A: *VRP* & Risk Factors ($R_m - R_f$, *SMB, HML* and *MOM*)

	X1	VRP^{BTZ}		VRP^{CW}		VRP^{DY}	
X2	Sample period	X1->X2	X2->X1	X1->X2	X2->X1	X1->X2	X2->X1
$R_m - R_f$	1992-2010	0.000	0.223	0.000	0.444	0.001	0.427
	1992-2006	0.000	0.354	0.000	0.167	0.008	0.862
	1994-2008	0.054	0.211	0.000	0.775	0.000	0.263
	1996-2010	0.000	0.238	0.000	0.021	0.003	0.531
SMB	1992-2010	0.745	0.274	0.339	0.035	0.037	0.527
	1992-2006	0.638	0.055	0.498	0.009	0.362	0.558
	1994-2008	0.666	0.071	0.404	0.051	0.019	0.802
	1996-2010	0.648	0.471	0.219	0.070	0.069	0.959
HML	1992-2010	0.044	0.002	0.006	0.307	0.000	0.835
	1992-2006	0.003	0.147	0.000	0.830	0.006	0.223
	1994-2008	0.256	0.182	0.043	0.679	0.015	0.967
	1996-2010	0.352	0.005	0.012	0.373	0.000	0.832
MOM	1992-2010	0.000	0.197	0.001	0.191	0.006	0.131
	1992-2006	0.000	0.073	0.052	0.688	0.000	0.286
	1994-2008	0.040	0.112	0.076	0.067	0.003	0.221
	1996-2010	0.001	0.339	0.005	0.432	0.015	0.052

Panel B: *ILLIQ* & Risk Factors ($R_m - R_f$, *SMB, HML* and *MOM*)

	X1	$ILLIQ^{NYSE}$		$ILLIQ^{SP500}$	
X2	Sample period	X1->X2	X2->X1	X1->X2	X2->X1
$R_m - R_f$	1992-2010	0.973	0.000	0.731	0.000
	1992-2006	0.300	0.000	0.190	0.000
	1994-2008	0.305	0.000	0.027	0.000
	1996-2010	0.846	0.000	0.791	0.000
SMB	1992-2010	0.845	0.037	0.116	0.023
	1992-2006	0.414	0.041	0.199	0.275
	1994-2008	0.442	0.339	0.246	0.011
	1996-2010	0.128	0.096	0.191	0.027
HML	1992-2010	0.659	0.070	0.240	0.122
	1992-2006	0.788	0.001	0.288	0.012
	1994-2008	0.431	0.001	0.860	0.029
	1996-2010	0.658	0.166	0.154	0.281
MOM	1992-2010	0.841	0.000	0.293	0.000
	1992-2006	0.798	0.000	0.411	0.000
	1994-2008	0.148	0.000	0.136	0.000
	1996-2010	0.652	0.000	0.451	0.000

4.6 Conclusion

This study investigates the Granger-causality relation among variance risk premium, illiquidity, and stock market returns using the US monthly data from January 1992 to December 2010. We find that the variance risk premium can trigger stock market returns, and in turn, illiquidity, but this conclusion does not hold vice versa. More importantly, market illiquidity cannot affect the stock market returns, but stock returns cause illiquidity. Our results are robust for different sub-sample periods and are also confirmed by the impulse response test. Consequently, the variance risk premium shows a strong predictive power for future excess stock returns, but illiquidity is found to have little predictive power.

In addition, we examine how the variance risk premium/illiquidity is related to the equity returns by investigating the Granger-causality relationship between the variance risk premium (and illiquidity) and the systematic risk factors contained in the augmented Fama and French (1993) model. We find that the variance risk premium triggers variations in the market risk premium, value factor and momentum factor, while market risk premium and momentum factor affect the illiquidity. These findings imply that the variance risk premium mainly drives equity returns, as its information is reflected in the time-varying market risk premium, value and momentum factors. Finally, illiquidity cannot affect equity returns by acting on the risk factors included in the Carhart (1997) four-factor model.

Chapter 5 Conclusions

This Chapter summarises the main findings of the thesis, and makes suggestions for future work.

Chapter 5 Conclusions

5.1 Main Findings

This thesis aims to apply liquidity to explain certain stock market phenomena. We investigate the explanatory power of liquidity on the disappearing dividend puzzle, and also the interplay among liquidity, stock market return and variance risk premium.

We begin by empirically examining the role of liquidity, risk and catering in explaining the disappearing dividend puzzle. This research adopts an extended sample period, 1989-2011, and covers a large sample of data covering eighteen countries, amalgamated into nine major financial markets: Canada, US, Hong Kong, Singapore, Australia, France, Germany, UK and Other European.

We first test the determinants of dividend payout policy. The results show that risk plays an important role in explaining the probability of a firm being a dividend payer. For the case of firms in the US, France, UK and Other European markets, liquidity is another important determinant of dividend policy, along with risk. Across the nine markets considered in our sample, the average marginal effects show that risk explains 14% to 33% and liquidity explains 4% to 11% of the firms' probability of paying dividends. Further, we also find that the firm-specific and market-driven risk variables remain strongly significant in explaining dividend payout policy, even after accounting for the effects of the firms' characteristics and liquidity.

Then, we study the role of liquidity, risk and catering in explaining the disappearing dividends puzzle. We find that catering incentive matters for firms operating in common law countries (Canada, Hong Kong, Singapore, Australia and UK in our sample). However, we find no evidence for the presence of catering incentive in firms operating in the US and in civil law markets (France, Germany and Other European in our sample). Our results concur with Ferris et al. (2009) in that countries with greater investor protection (common law countries) are more responsive to changing investor preferences and therefore significant catering occurs in such countries. With regard to the effects of liquidity, we find that liquidity fails to replace catering incentives in explaining the changes in propensity to pay across markets. However, once adjusted for risk, the changes in propensity to pay can no longer be explained by the catering incentive, even among the common law countries. Our results indicate that the role of catering reflects risk difference between dividend payers and non-dividend payers. Our evidence corroborates Hoberg and Prabhala's (2009) findings in the US market and reveals that the risk-based explanation of the catering phenomenon persists across several financial markets.

We next examine the dividend payout patterns in China. China is a fast-growing economy, but with a relatively low level of corporate governance and with complicated ownership structure. (Anderson et al., 2009) This research investigates the impact of shareholder, managers and board on both the cash dividend payments and stock dividend payments in China over the sample period 1999-2013.

For the cash dividend payouts, we first employ a logit model to explore the determinants of cash dividend payouts. The results show that liquidity and risk are significantly negatively related with the probability of being a cash dividend payer. Further, managerial stake is insignificantly associated with firms' cash dividend payout policy, while firms with larger board size and fewer annual board meetings are more likely to pay cash dividend. Then we test the catering theory for cash dividend payments. The result shows that catering incentive is positively associated with the changes in the unadjusted propensity to pay cash dividends, even after controlling the financial crisis dummy. Further, catering incentive still matters in explaining the propensity to pay after we adjust the propensity with managerial stake or board characteristics. However, the significant explanatory power of catering incentive disappears once we control for liquidity or risk. This means that the catering incentive actually measures the difference in firms' liquidity or risk between cash dividend payers and non-cash dividend payers. Therefore, board structure, rather than managerial stake or shareholders' preference, exerts influence on the cash dividend payout decisions in China.

For the stock dividend payouts, the result of the logit model shows that risk can negatively impact the probability of being a stock dividend payer, while liquidity measured by turnover can positively influence stock dividend payments in China over our sample period. This supports our prediction that firms with higher liquidity are always accompanied with higher stock price; such firms prefer to pay stock dividend to realign stock price into preferred price ranges. Additionally, managerial stake contributes little to explain firms' stock dividend payments, and firms with larger board size are less likely to pay stock dividend. Then we test the catering theory for stock dividend payouts in China. The results illustrate that dividend premium matters for the changes in unadjusted propensity, and for the propensity adjusted for managerial stake and board structure. However, once we control liquidity or risk, the catering incentive contributes little toward explaining the changes in propensity to pay stock dividend. This implies that stock dividend premium captures the different characteristics (risk and liquidity) of the firms. Therefore, board, rather than managers or shareholders, can impact firms' stock dividend decisions in China.

The study of the interplay among liquidity, stock market return and variance risk premium enables us to gain a comprehensive understanding of the direction of magnitude of the relation between (il)liquidity and market return, the relation between variance risk premium and market return, and the relation between (il)liquidity and variance risk premium. To do so, we investigate the interplay among variance risk premium, (il)liquidity, and market returns using the US monthly data from Jan 1992 to Dec 2010.

We first test the Granger causality relation among (il)liquidity, variance risk premium and market returns. The results show that the variance risk premium can trigger market returns, and in turn, illiquidity, but this conclusion does not hold vice versa. More importantly, market illiquidity cannot affect the market returns, but stock returns Granger-cause illiquidity. Our results are robust for different sub-sample periods and are also confirmed by the impulse response test. Consequently, the variance risk premium shows a strong predictive power for future excess stock returns, but little predictive power of illiquidity is found.

In addition, this study examines how the variance risk premium/illiquidity is related to the equity returns by investigating the Granger-causality relationship between the variance risk premium (and illiquidity) and the systematic risk factors contained in the augmented Fama and French (1993) model. We find that the variance risk premium triggers variations in the market risk premium, value factor and momentum factor, while market risk premium and momentum factor affect the illiquidity. These findings imply that the variance risk premium mainly drives equity returns, as its information is reflected in the time-varying market risk premium, value and momentum factors. Finally, illiquidity cannot affect equity returns by acting on the risk factors included in the Carhart (1997) four-factor model.

5.2 Future Research

Several interesting areas have emerged for further research.

First, future research may investigate the explanatory power of liquidity, risk and catering on the share repurchase decisions. Our study has concentrated on dividends, but firms may also pay out cash to their shareholders via share repurchase. As argued by Allen and Michaely (2003), the surge in share repurchases is one of six major aspects of dividend policy. Therefore, our research could be extended to share repurchase decisions.

Second, the empirical model in our study is a discrete model in which firms are classified as either dividend payers or nonpayers. However, Li and Lie (2004) argue that corporate managers are far more likely to face decisions related to changing the level of existing dividends rather than decisions to pay or not pay dividends. Therefore, our study could be extended to include decreases and increases in existing dividends.

Third, liquidity is generally described as the ability to trade large quantities quickly at low cost with little price impact. This definition highlights four dimensions of liquidity: trading speed, trading quantity, trading cost and price impact. Therefore, when testing the interplay among illiquidity, variance risk premium and market return, we could use another proxy for liquidity, such as Liu's (2006) liquidity measure and turnover.

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